



STIC Search Report

EIC 1700

STIC Database Tracking Number: 208700

TO: Michael Bernshteyn
Location: Remsen 10a34
Art Unit : 1713
November 29, 2006
Phone: 571-272-2411
Serial Number: 10 / 530965

From: Jan Delaval
Location: EIC 1700
Remsen 4a30
Phone: 571-272-2504
jan.delaval@uspto.gov

Search Notes

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: MICHAEL BERNSTEIN Examiner #: 81575 Date: 11/28/06
 Art Unit: 1713 Phone Number 30 272-3411 Serial Number: 10/080,966
 Mail Box and Bldg/Room Location: DM 10A34 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Composite ion-exchange membrane

Inventors (please provide full names): Kota Kishimura, Yoshimichi Sakaguchi,
Shigenori Nagahara, Shiro Hamamoto, Norihiko Takimoto, etc.

Earliest Priority Filing Date: 10/17/2002

For Sequence Searches Only Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

Please, try to find the compounds represented by formulas (1) - (15) according claims 1-10

Thank you

M. Bernstein

SCIENTIFIC REFERENCE-BR
Sci & Tech Inf. Ctr

NOV 26 2006

Pat. & T.M. Office

STAFF USE ONLY		Type of Search	Vendors and cost where applicable
Searcher:	<u>John</u>	NA Sequence (#)	STN <input checked="" type="checkbox"/>
Searcher Phone #:	<u>22504</u>	AA Sequence (#)	Dialog <input type="checkbox"/>
Searcher Location:		Structure (#)	Questel/Orbit <input checked="" type="checkbox"/>
Date Searcher Picked Up:	<u>11/28/06</u>	Bibliographic	Dr. Link <input type="checkbox"/>
Date Completed:	<u>11/29/06</u>	Litigation	Lexis/Nexis <input type="checkbox"/>
Searcher Prep & Review Time:		Fulltext	Sequence Systems <input type="checkbox"/>
Clerical Prep Time:	<u>30</u>	Patent Family	WWW/Internet <input type="checkbox"/>
Online Time:	<u>130</u>	Other	Other (specify) <input type="checkbox"/>

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FILE 'REGISTRY' ENTERED AT 09:17:56 ON 29 NOV 2006
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STRUCTURE FILE UPDATES: 27 NOV 2006 HIGHEST RN 914071-04-8
DICTIONARY FILE UPDATES: 27 NOV 2006 HIGHEST RN 914071-04-8

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<http://www.cas.org/ONLINE/UG/regprops.html>

=> d sta que 111
L7 STR
18 22 40 38
O O G2 O
|| || | |||
S @16 C — G1 — Cb — S 36
||| @20 33 34 35 |||
O O 39
19

VAR G1=16/20
VAR G2=O/X
NODE ATTRIBUTES:
DEFAULT MLEVEL IS ATOM
GGCAT IS MCY UNS AT 33
GGCAT IS MCY UNS AT 35
DEFAULT ECLEVEL IS LIMITED
ECOUNT IS E6 C AT 33
ECOUNT IS E6 C AT 35

GRAPH ATTRIBUTES:
RING(S) ARE ISOLATED OR EMBEDDED
NUMBER OF NODES IS 12

STEREO ATTRIBUTES: NONE
L9 SCR 2043
L11 618 SEA FILE=REGISTRY SSS FUL L7 AND L9

100.0% PROCESSED 53347 ITERATIONS
SEARCH TIME: 00.00.01

618 ANSWERS

=> d his

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 SEL RN

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 L3 STR
 L4 20 S L3
 L5 STR L3
 L6 45 S L5
 L7 STR L5
 L8 2 S L7
 L9 SCR 2043
 L10 21 S L7 AND L9
 L11 618 S L7 AND L9 FUL
 SAV TEMP L11 BERN530/A
 L12 42 S L11 AND 1/NC
 L13 3 S L12 AND (C24H16010S3 OR C25H1609S2 OR C38H2409S2)
 L14 11 S L12 AND (C27H22010S3 OR C24H16012S4 OR C31H30010S3 OR C25H160
 L15 10 S L14 NOT 196301-55-0
 L16 93 S L11 AND C12H1002
 L17 82 S L11 AND 92-88-6/CRN
 L18 11 S L16 NOT L17
 L19 10 S L18 NOT 1079-21-6/CRN
 L20 92 S L17,L19
 L21 57 S L11 AND C25H1802
 L22 57 S L11 AND 3236-71-3/CRN
 L23 57 S L21,L22
 L24 135 S L20,L23
 L25 31 S L11 AND 843-55-0/CRN
 L26 31 S L11 AND C18H2002
 L27 31 S L25,L26
 L28 160 S L24,L27
 L29 3 S L2 AND L28
 L30 2 S L2 NOT L29
 L31 STR
 L32 0 S L31 SAM SUB=L11
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 L34 27 S L33 AND L28
 L35 7 S L34 AND ((C6-C6 OR NCNCNC) /ES OR C26H16CL204S OR C12H8CL205S2
 L36 20 S L34 NOT L35
 L37 153 S L28,L36 NOT L35
 L38 84 S L37 AND (C6H602 OR C13H8F207S2 OR C19H12F2013S4)
 L39 15 S L38 NOT 345-92-6/CRN
 SEL RN 7 8 10 11 13 14
 L40 6 S E6-E11
 L41 69 S L38 NOT L39
 L42 5 S L41 AND 3/NC
 L43 29 S L41 AND 4/NC
 L44 5 S L43 AND NA/ELS
 L45 35 S L41 NOT L42-L44
 SEL RN 5 14 15 24 27 30 33
 L46 7 S E12-E18
 L47 4 S L40 NOT (862773-05-5 OR 1478-61-1/CRN)

L48 2 S L15 AND (912548-40-4 OR 912548-38-0)
 L49 69 S L37 NOT L38-L48
 L50 13 S L49 AND C7H3CL2N
 SEL RN 3 4 6 7
 L51 9 S L50 NOT E19-E22
 L52 56 S L49 NOT L50
 L53 12 S L52 AND 3/NC
 SEL RN 2 7 10 12
 L54 4 S E23-E26
 L55 22 S L52 AND 4/NC
 SEL RN 6 8 12 13 15-19 21 22
 L56 11 S E27-E37
 L57 22 S L52 NOT L53,L55
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 L59 1 S 463-79-6
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 L61 1 S L11 AND L60
 L62 49 S L58 NOT L61

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L63 2 S L61
 L64 106 S L62
 L65 14 S L63,L64 AND L59,L60
 L66 19 S L63,L64 AND (CARBONATE OR BICARBONATE OR CARBONIC ACID OR BIC
 L67 21 S L65,L66
 L68 8 S L63,L64 AND PY<=2002 NOT P/DT
 L69 21 S L63,L64 AND (PD<=20021017 OR PRD<=20021017 OR AD<=20021017)
 L70 7 S L68,L69 AND L67
 L71 37 S L63,L64 AND (KITAMURA? OR SAKAGUCHI? OR NAGAHARA? OR HAMAMOTO
 L72 40 S L63,L64 AND (TOYO? OR BOSEKI? OR KABUSHIKI?)/PA,CS
 L73 5 S L71,L72 AND L68,L69
 L74 10 S L70,L73
 L75 11 S L68,L69 NOT L74
 L76 4 S L74 AND (ION(L)EXCHANG?(L) (MEMBRAN? OR RESIN? OR COMPOSITION
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 L78 8 S L76,L77
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 L80 3 S L79 AND L71,L72
 L81 11 S L78,L80
 L82 10 S L74,L75 NOT L81
 SEL AN DN 5 7-10
 L83 5 S L82 NOT E38-E52
 L84 16 S L81,L83
 L85 5 S L74,L75 NOT L84
 E ION EXCHANGE/CT
 E E3+ALL
 L86 26135 S E3+NT
 L87 8009 S E11+OLD,NT OR E12+OLD,NT
 E E13+ALL
 L88 45068 S E4,E5,E13,E16,E17,E18,E21-E23,E25
 L89 4 S L68,L69 AND L86-L88
 E MEMBRANE/CT
 E E3+ALL
 L90 43734 S E1
 E E2+ALL
 L91 118206 S E3+OLD OR E15-E21
 L92 11 S L68,L69 AND L90,L91
 L93 17 S L84,L89,L92
 L94 4 S L69,L69 NOT L93

L95 21 S L93, L94 AND L1, L63-L94

FILE 'REGISTRY' ENTERED AT 09:17:56 ON 29 NOV 2006

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 FILE LAST UPDATED: 27 Nov 2006 (20061127/ED)

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This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d 195 bib abs hitind hitstr retable tot

L95 ANSWER 1 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN
 AN 2005:1132936 HCAPLUS
 DN 143:406557
 TI Ion-conductive copolymers containing one or more hydrophobic oligomers
 IN Chen, Jian Ping
 PA Polyfuel, Inc., USA
 SO U.S. Pat. Appl. Publ., 38 pp., Cont.-in-part of U.S. Ser. No. 438,299.
 CODEN: USXXCO
 DT Patent
 LA English
 FAN.CNT 6

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2005234146	A1	20051020	US 2004-987951	20041112 <--
	US 2004126666	A1	20040701	US 2003-438299	20030513 <--
	US 7094490	B2	20060822		
	US 2006135657	A1	20060622	US 2006-350228	20060207 <--
PRAI	US 2002-381136P	P	20020513 <--		
	US 2003-438299	A2	20030513		
	US 2003-520266P	P	20031113		
	US 2004-545293P	P	20040217		
	US 2003-449299P	P	20030220		
AB	In one aspect, the invention provides ion conductive copolymers comprising (1) a plurality of first oligomers, (2) a plurality of second oligomers, (3) ion conductive monomers and (4) linking monomers. The oligomers preferably are hydrophobic and together with the ion conductive monomers are randomly dispersed between the linking monomers. Uses of such polymeric materials include the formation of polymer electrolyte membranes (PEMs), catalyst coated membranes (CCM's) and membrane electrolyte				

assemblies (MEA's) which may be used in fuel cells and the like. An ion-conducting copolymer was prepared from a 9,9-bis(4-hydroxyphenyl)fluorene-4,4'-difluorobenzophone oligomer.

IC ICM C08G0002-00

INCL 522090000

CC 37-3 (Plastics Manufacture and Processing)

IT **Ion exchange membranes**

(proton **exchange**; ion-conductive copolymers containing one or more hydrophobic oligomers)

IT 40793-56-4P, 9,9-Bis(4-hydroxyphenyl)fluorene-4,4'-difluorobenzophone copolymer 690662-65-8P **690662-70-5P** 690662-71-6P

690662-72-7P 690662-75-0P 690662-76-1P 690662-79-4P 690662-81-8P

690662-82-9P 690663-41-3P 867044-45-9P 867044-46-0P 867044-47-1P

867044-48-2P 867044-49-3P 867044-50-6P 867044-51-7P 867044-52-8P

RL: IMF (Industrial manufacture); PREP (Preparation)

(ion-conductive copolymers containing one or more hydrophobic oligomers)

IT **690662-70-5P**

RL: IMF (Industrial manufacture); PREP (Preparation)

(ion-conductive copolymers containing one or more hydrophobic oligomers)

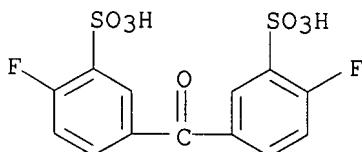
RN 690662-70-5 HCPLUS

CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, polymer with bis(4-fluorophenyl)methanone and 4,4'-cyclohexylidenebis[phenol], block (9CI) (CA INDEX NAME)

CM 1

CRN 625392-06-5

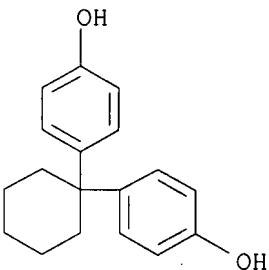
CMF C13 H8 F2 O7 S2



CM 2

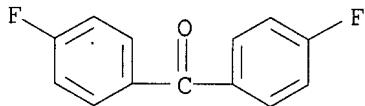
CRN 843-55-0

CMF C18 H20 O2



CM 3

CRN 345-92-6
 CMF C13 H8 F2 O



L95 ANSWER 2 OF 21 HCPLUS COPYRIGHT 2006 ACS on STN
 AN 2005:824448 HCPLUS
 DN 143:232677
 TI Ion conductive random copolymers for electrolyte membranes in fuel cells
 IN Cao, Shuguang; Chen, Jian Ping; Jeanes, Thomas; Nam, Kie Hyun; Olmeijer, David; Xu, Helen
 PA USA
 SO U.S. Pat. Appl. Publ., 17 pp., Cont.-in-part of U.S. Ser. No. 438,186.
 CODEN: USXXCO
 DT Patent
 LA English
 FAN.CNT 6

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2005181256	A1	20050818	US 2004-987178	20041112 <--
	US 2004039148	A1	20040226	US 2003-438186	20030513 <--
	US 2006135657	A1	20060622	US 2006-350228	20060207 <--
PRAI	US 2002-381136P	P	20020514 <--		
	US 2002-426540P	P	20021115		
	US 2003-446395P	P	20030210		
	US 2003-438186	A2	20030513		
	US 2003-449299P	P	20030220		
	US 2003-438299	A3	20030513		

AB This invention relates to **ion** conducting random copolymers that are useful in forming polymer electrolyte **membranes** used in fuel cells. A catalyst-coated **membrane** comprises a proton **exchange membrane** where all or part of ≥ 1 of the opposing surface of the **membrane** comprises a catalyst layer.

IC ICM H01M0008-00
 INCL 429033000; X42-931.4; X42-931.7; X52-628.7; X52-631.6; X52-630.75
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38

IT **Membranes, nonbiological**
 (catalyst-coated; ion conductive random copolymers for electrolyte membranes in fuel cells)

IT Fuel cells
 (proton **exchange membrane**; **ion** conductive random copolymers for electrolyte **membranes** in fuel cells)

IT 210531-46-7P 334658-51-4P 474242-19-8P 737611-77-7P 862772-88-1P
 862772-89-2P 862772-90-5P **862772-91-6P 862772-92-7P**
862772-93-8P 862772-94-9P 862772-95-0P
 862772-96-1P 862772-97-2P 862772-98-3P 862772-99-4P 862773-00-0P
 862773-01-1P **862773-02-2P** 862773-03-3P 862773-04-4P
 862773-05-5P 862773-06-6P 862773-07-7P 862773-08-8P
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 (ion conductive random copolymers for electrolyte membranes in fuel cells)

IT **862772-91-6P 862772-92-7P 862772-93-8P**

862772-94-9P 862772-95-0P 862773-02-2P

RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(ion conductive random copolymers for electrolyte membranes in fuel cells)

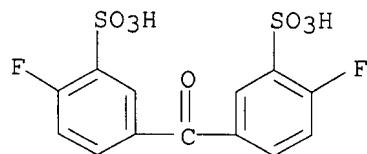
RN 862772-91-6 HCAPLUS

CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, disodium salt, polymer with bis(4-fluorophenyl)methanone and 4,4'-cyclohexylidenebis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 210531-45-6

CMF C13 H8 F2 O7 S2 . 2 Na

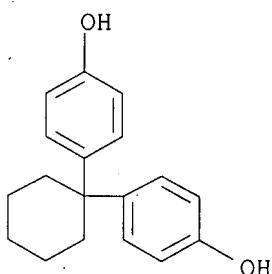


●2 Na

CM 2

CRN 843-55-0

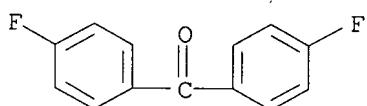
CMF C18 H20 O2



CM 3

CRN 345-92-6

CMF C13 H8 F2 O



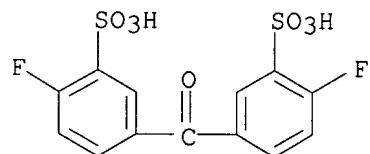
RN 862772-92-7 HCAPLUS

CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, disodium salt, polymer with 4,4'-cyclohexylidenebis[phenol] and 1,1'-sulfonylbis[4-fluorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 210531-45-6

CMF C13 H8 F2 O7 S2 . 2 Na

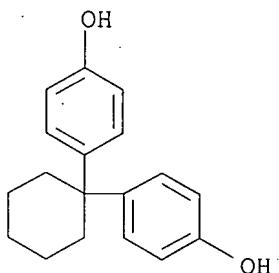


● 2 Na

CM 2

CRN 843-55-0

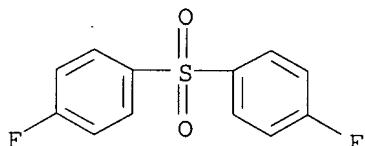
CMF C18 H20 O2



CM 3

CRN 383-29-9

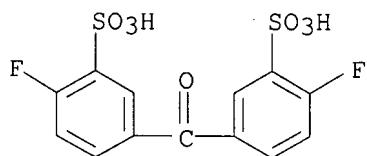
CMF C12 H8 F2 O2 S



RN 862772-93-8 HCAPLUS

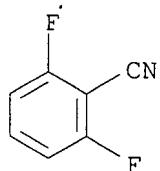
CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, disodium salt, polymer with bis(4-fluorophenyl)methanone, 4,4'-cyclohexylidenebis[phenol] and 2,6-difluorobenzonitrile (9CI) (CA INDEX NAME)

CM 1

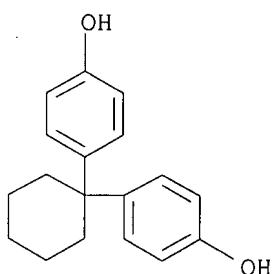
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CMF C13 H8 F2 O7 S2 . 2 Na

● 2 Na

CM 2

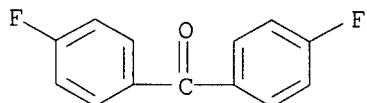
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CM 3

CRN 843-55-0
CMF C18 H20 O2

CM 4

CRN 345-92-6
CMF C13 H8 F2 O



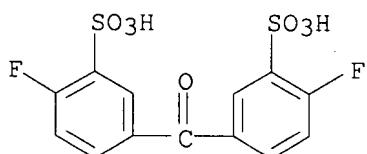
RN 862772-94-9 HCAPLUS

CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, disodium salt, polymer with bis(4-fluorophenyl)methanone and 4,4'-(9H-fluoren-9-ylidene)bis[phenol]] (9CI) (CA INDEX NAME)

CM 1

CRN 210531-45-6

CMF C13 H8 F2 O7 S2 . 2 Na

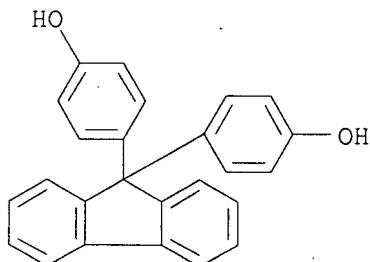


● 2 Na

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CRN 3236-71-3

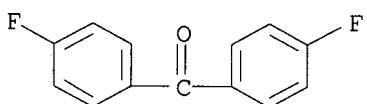
CMF C25 H18 O2



CM 3

CRN 345-92-6

CMF C13 H8 F2 O



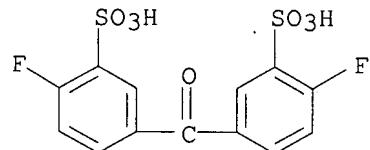
RN 862772-95-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, disodium salt, polymer with bis(4-fluorophenyl)methanone, 4,4'-cyclohexylidenebis[phenol] and 4,4'-(9H-fluoren-9-ylidene)bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 210531-45-6

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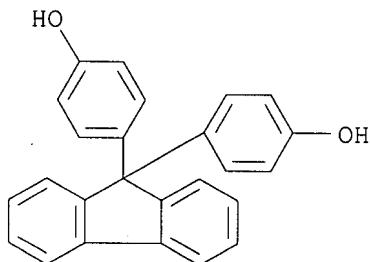


● 2 Na

CM 2

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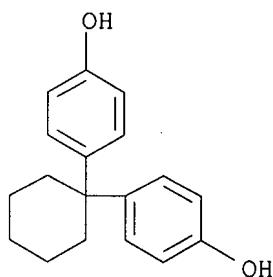
CMF C25 H18 O2



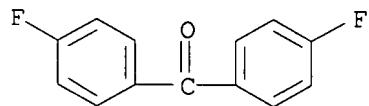
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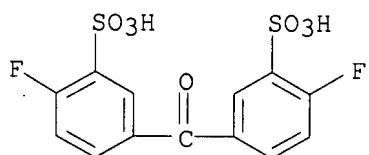
CMF C18 H20 O2



CM 4

CRN 345-92-6
CMF C13 H8 F2 ORN 862773-02-2 HCAPLUS
CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and bis(4-fluorophenyl)methanone (9CI) (CA INDEX NAME)

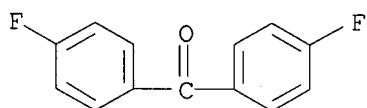
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CRN 210531-45-6
CMF C13 H8 F2 O7 S2 . 2 Na

●2 Na

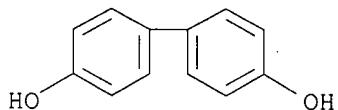
CM 2

CRN 345-92-6
CMF C13 H8 F2 O



CM 3

CRN 92-88-6
 CMF C12 H10 O2



L95 ANSWER 3 OF 21 HCPLUS COPYRIGHT 2006 ACS on STN
 AN 2004:414812 HCPLUS
 DN 140:409658
 TI Ion conductive block copolymers for polymer electrolyte membrane fuel cells
 IN Xu, Helen; Cao, Shuguang; Chen, Jingping; Jeanes, Thomas; Nam, Kie Hyun
 PA Polyfuel, Inc., USA
 SO PCT Int. Appl., 53 pp.
 CODEN: PIXXD2

DT Patent
 LA English

FAN.CNT 6

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2004042839	A2	20040521	WO 2003-US15351	20030513 <--
	WO 2004042839	A3	20050127		
	W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
	CA 2485971	AA	20040521	CA 2003-2485971	20030513 <--
	AU 2003299502	A1	20040607	AU 2003-299502	20030513 <--
	EP 1518290	A2	20050330	EP 2003-799789	20030513 <--
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
	CN 1669169	A	20050914	CN 2003-816347	20030513 <--
	JP 2006512428	T2	20060413	JP 2004-549894	20030513 <--
	US 2006135657	A1	20060622	US 2006-350228	20060207 <--
PRAI	US 2002-381136P	P	20020514 <--		
	US 2003-449299P	P	20030220		
	US 2003-438299	A3	20030513		
	WO 2003-US15351	W	20030513		

AB This invention relates to ion conductive copolymers which are useful in

forming polymer electrolyte membranes used in fuel cells. In a catalyst coated membrane, at least one of the opposing surfaces of the membrane comprises a catalyst layer.

IC ICM H01M

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 38

IT **584-08-7P**, Potassium **carbonate** 25897-65-8P, Bisphenol A-4,4'-difluorobenzophenone copolymer 40793-56-4P, 9,9-Bis(4-hydroxyphenyl)fluorene-4,4'-difluorobenzophenone copolymer 69254-20-2P 117344-37-3P 125938-56-9P 193410-35-4P, 4,4'-Difluorobenzophenone-4,4'-dihydroxydiphenyl ether copolymer 625392-07-6P 690662-65-8P **690662-66-9P** 690662-67-0P 690662-68-1P 690662-69-2P **690662-70-5P** 690662-71-6P 690662-72-7P 690662-73-8P 690662-74-9P 690662-75-0P 690662-76-1P 690662-77-2P 690662-78-3P 690662-79-4P 690662-80-7P 690662-81-8P 690662-82-9P 690663-41-3P
RL: SPN (Synthetic preparation); PREP (Preparation)
(ion conductive block copolymers for polymer electrolyte membrane fuel cells)

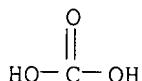
IT **584-08-7P**, Potassium **carbonate** **690662-66-9P**
690662-70-5P

RL: SPN (Synthetic preparation); PREP (Preparation)

(ion conductive block copolymers for polymer electrolyte membrane fuel cells)

RN 584-08-7 HCPLUS

CN Carbonic acid, dipotassium salt (8CI, 9CI) (CA INDEX NAME)



● 2 K

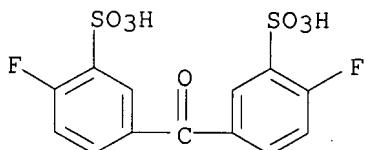
RN 690662-66-9 HCPLUS

CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, polymer with bis(4-fluorophenyl)methanone and 4,4'-(9H-fluoren-9-ylidene)bis[phenol], block (9CI) (CA INDEX NAME)

CM 1

CRN 625392-06-5

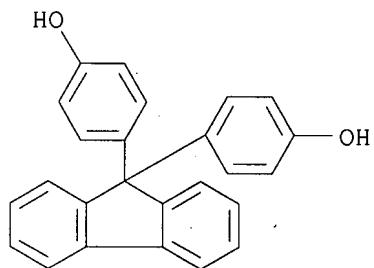
CMF C13 H8 F2 O7 S2



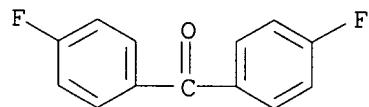
CM 2

CRN 3236-71-3

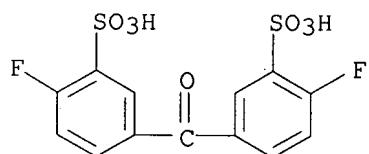
CMF C25 H18 O2



CM 3

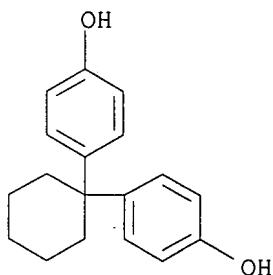
CRN 345-92-6
CMF C13 H8 F2 ORN 690662-70-5 HCPLUS
CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, polymer with
bis(4-fluorophenyl)methanone and 4,4'-cyclohexylidenebis[phenol], block
(9CI) (CA INDEX NAME)

CM 1

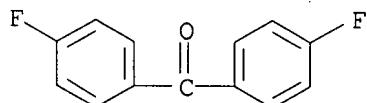
CRN 625392-06-5
CMF C13 H8 F2 O7 S2

CM 2

CRN 843-55-0
CMF C18 H20 O2



CM 3

CRN 345-92-6
CMF C13 H8 F2 OL95 ANSWER 4 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN
AN 2004:355275 HCAPLUS

DN 140:376230

TI Composite ion exchanger membrane

IN Kitamura, Kota; Sakaguchi, Yoshimitsu; Nagahara, Shigenori; Hamamoto, Shiro; Takimoto, Naohiko; Sugihara, Hideki; Takase, Satoshi; Kitagawa, Tooru; Saito, Miyako

PA Toyo Boseki Kabushiki Kaisha, Japan

SO PCT Int. Appl., 92 pp.

CODEN: PIXXD2

DT Patent

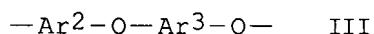
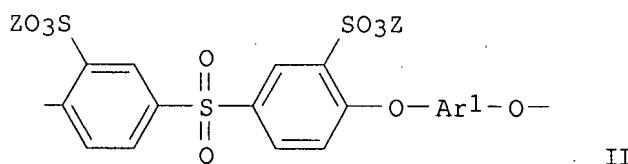
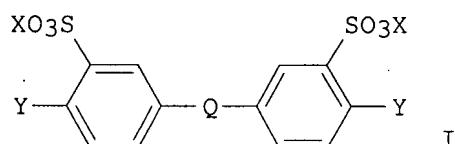
LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2004036679	A1	20040429	WO 2003-JP13278	20031016 <--
	W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
	JP 2004139836	A2	20040513	JP 2002-303289	20021017 <--
	JP 2004139837	A2	20040513	JP 2002-303290	20021017 <--
	JP 2004143388	A2	20040520	JP 2002-312837	20021028 <--
	JP 2004169003	A2	20040617	JP 2003-355364	20031015 <--
	AU 2003273034	A1	20040504	AU 2003-273034	20031016 <--
	US 2006241192	A1	20061026	US 2005-530965	20050411 <--

PRAI	JP 2002-303289	A	20021017	<--
	JP 2002-303290	A	20021017	<--
	JP 2002-312837	A	20021028	<--
	JP 2002-313025	A	20021028	<--
	WO 2003-JP13278	W	20031016	<--

GI



AB The **membrane** has **ion exchanger resin** in the continuous through holes in a support **membrane**, where the **ion exchanger resin** contains an aromatic ether and/or its derivative, formed by polymerization of mixture containing monomers I (Q =-SO₂- or -CO-, X = H, Li, Na, or K, Y = F, Cl, Br, or I), aromatic dihalides, and bisphenol compound and alkali metal (bi)carbonate. The **ion exchange resin** contain 0-1000 structural units II (Z = H, Li, Na, K, or cation derived. from aliphatic or aromatic amines; Ar1 and Ar3 = bivalent organic groups, Ar2 = bivalent organic groups containing ≥ 1 arom ring having electron attracting group) and 0-1000 structural units III. The **composite membrane** may be used as fuel cell electrolyte.

IC ICM H01M0008-02
ICS C08J0005-22

CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 52

ST **composite ion exchanger membrane**
compn fuel cell electrolyte

IT Fuel cell electrolytes
(**composite membranes** containing **ion exchanger resins** in porous polymer support **membranes** for fuel cell electrolytes)

IT Polyphosphoric acids
RL: TEM (Technical or engineered material use); USES (Uses)
(**composite membranes** containing **ion exchanger resins** in porous polymer support **membranes** for fuel cell electrolytes)

IT 75-75-2, Methanesulfonic acid 60871-72-9 146673-89-4

267877-35-0 681035-31-4

RL: TEM (Technical or engineered material use); USES (Uses)
 (composite membranes containing ion
 exchanger resins in porous polymer support
 membranes for fuel cell electrolytes)

IT 146673-89-4 267877-35-0 681035-31-4

RL: TEM (Technical or engineered material use); USES (Uses)
 (composite membranes containing ion
 exchanger resins in porous polymer support
 membranes for fuel cell electrolytes)

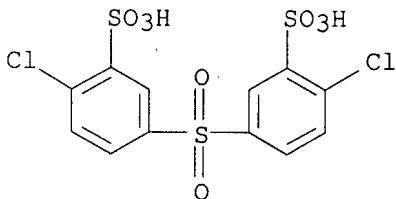
RN 146673-89-4 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer
 with 4,4'-(9H-fluoren-9-ylidene)bis[phenol] and 1,1'-sulfonylbis[4-
 chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

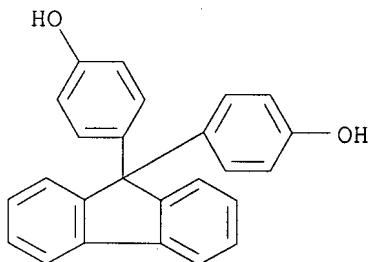


●2 Na

CM 2

CRN 3236-71-3

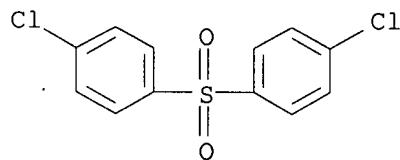
CMF C25 H18 O2



CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



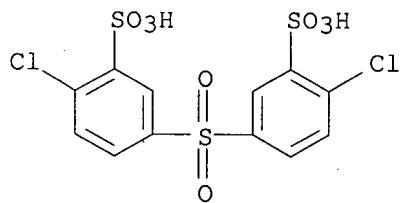
RN 267877-35-0 HCPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

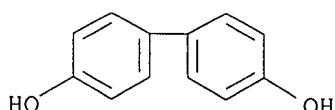


●2 Na

CM 2

CRN 92-88-6

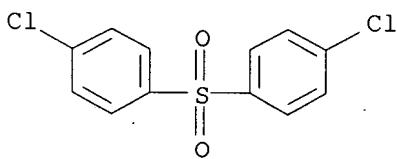
CMF C12 H10 O2



CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



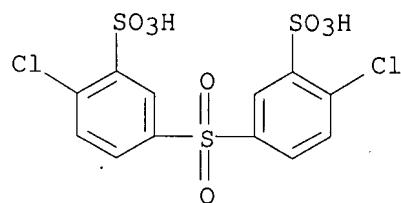
RN 681035-31-4 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 2,6-dichlorobenzonitrile (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

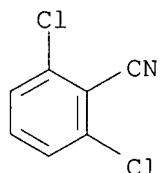


●2 Na

CM 2

CRN 1194-65-6

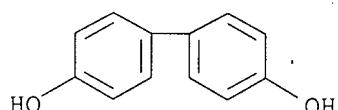
CMF C7 H3 Cl2 N



CM 3

CRN 92-88-6

CMF C12 H10 O2



L95 ANSWER 5 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 2004:333769 HCAPLUS

DN 140:340474

TI Polyarylene ether compounds containing sulfonic acid groups, their compositions and manufacture method

IN Sakaguchi, Yoshimitsu; Kitamura, Kota; Nagahara, Shigenori; Yamashita, Masahiro; Nakao, Junko

PA Toyo Boseki Kabushiki Kaisha, Japan

SO PCT Int. Appl., 75 pp.

CODEN: PIXXD2

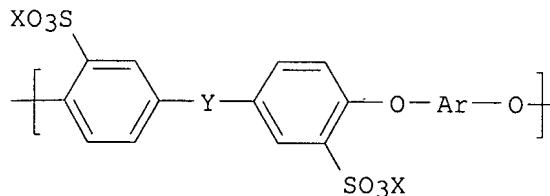
DT Patent

LA Japanese

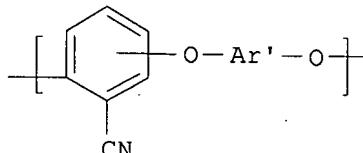
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
JP	2004244437	A2	20040902	JP 2003-32622	20030210
AU	2003268784	A1	20040504	AU 2003-268784	20031007 <--
JP	2004149779	A2	20040527	JP 2003-348477	20031007 <--
EP	1561768	A1	20050810	EP 2003-748749	20031007 <--
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CN	1703443	A	20051130	CN 2003-80100996	20031007 <--
JP	2004263167	A2	20040924	JP 2003-367183	20031028
US	2006166048	A1	20060727	US 2005-530199	20050404 <--
PRAI	JP 2002-295284	A	20021008 <--		
	JP 2003-32621	A	20030210		
	JP 2003-32622	A	20030210		
	WO 2003-JP12850	W	20031007		

GI



I



II

AB The title polymers, showing good ion conductivity and heat resistance, comprise the units of I and II (Ar, Ar' = divalent aromatic group; X = H, monovalent cation; Y = SO₂, CO). The polymers and their compns. containing polybenzimidazoles are useful for ion-conductive films, electrolytes, fuel cells, and adhesives. Thus, a 1:0.38:0.62 (mol) 4,4'-biphenol-3,3'-

disulfo-4,4'-dichlorodiphenylsulfone disodium salt-2,6-dichlorobenzonitrile copolymer was prepared and made into a film showing 3%-weight loss temperature 380° and ion conductivity 0.14 S/cm.

IC ICM C08G0065-40

ICS C09J0171-08; H01M0008-02; H01M0008-10

CC 38-3 (Plastics Fabrication and Uses)

Section cross-reference(s): 37, 52

IT 425636-38-0P, 2,5-Dicarboxybenzenesulfonic acid monosodium salt-3,3',4,4'-tetraaminodiphenylsulfone copolymer 426255-33-6P
681035-31-4P

RL: IMF (Industrial manufacture); POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(heat-resistant sulfo-containing polyethers for ion-conductive films)

IT 94196-53-9DP, sulfonated 94196-69-7DP, 4,4'-Biphenol-2,6-dichlorobenzonitrile copolymer, sulfonated **681035-32-5P**

681035-34-7DP, sulfonated **681035-35-8P** 681035-36-9P

681035-37-0P 681144-72-9DP, sulfonated

RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(heat-resistant sulfo-containing polyethers for ion-conductive films)

681035-31-4P

RL: IMF (Industrial manufacture); POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(heat-resistant sulfo-containing polyethers for ion-conductive films)

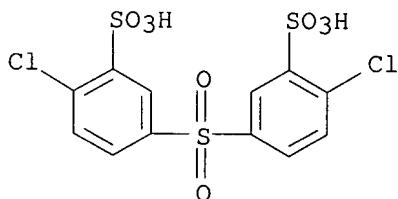
RN 681035-31-4 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 2,6-dichlorobenzonitrile (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

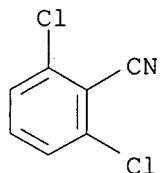


●2 Na

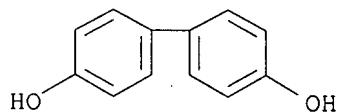
CM 2

CRN 1194-65-6

CMF C7 H3 Cl2 N



CM 3

CRN 92-88-6
CMF C12 H10 O2

IT 681035-32-5P 681035-35-8P 681035-37-0P

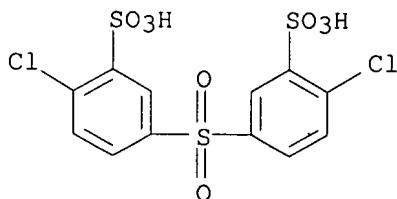
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(heat-resistant sulfo-containing polyethers for ion-conductive films)

RN 681035-32-5 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol, 2,6-dichlorobenzonitrile and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

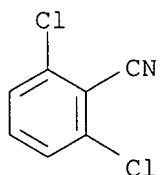
CM 1

CRN 51698-33-0
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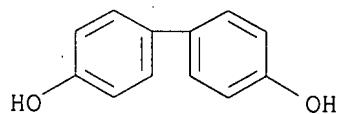
●2 Na

CM 2

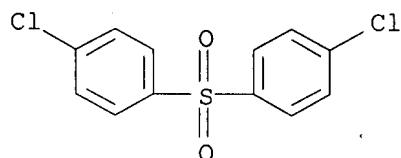
CRN 1194-65-6
CMF C7 H3 Cl2 N



CM 3

CRN 92-88-6
CMF C12 H10 O2

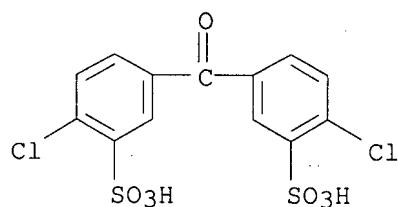
CM 4

CRN 80-07-9
CMF C12 H8 Cl2 O2 S

RN 681035-35-8 HCPLUS
 CN Benzenesulfonic acid, 3,3'-carbonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 2,6-dichlorobenzonitrile (9CI) (CA INDEX NAME)

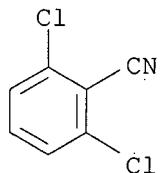
CM 1

CRN 57004-46-3
CMF C13 H8 Cl2 O7 S2 . 2 Na

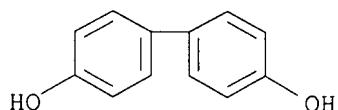


●2 Na

CM 2

CRN 1194-65-6
CMF C7 H3 Cl2 N

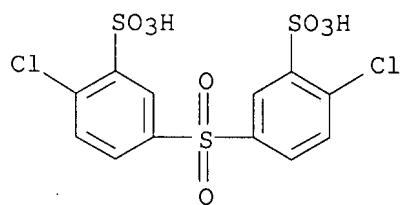
CM 3

CRN 92-88-6
CMF C12 H10 O2

RN 681035-37-0 HCPLUS
 CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 2,4-difluorobenzonitrile (9CI) (CA INDEX NAME)

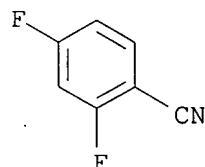
CM 1

CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na

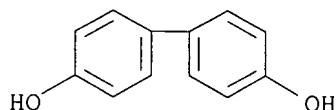


●2 Na

CM 2

CRN 3939-09-1
CMF C7 H3 F2 N

CM 3

CRN 92-88-6
CMF C12 H10 O2

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Foster-Miller Inc	1999			JP 2003503510 A	
Foster-Miller Inc	1999			WO 99010165 A	
Honda Motor Co Ltd	2002			JP 2002367629 A	HCAPLUS
Jsr Corp	2002			JP 2002220530 A	HCAPLUS
Toyobo Co Ltd	2003			JP 2003012795 A	HCAPLUS
Toyobo Co Ltd	2003			JP 2003217342 A	HCAPLUS

L95 ANSWER 6 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 2003:913207 HCAPLUS

DN 139:396487

TI Sulfonated copolymer for polymer electrolyte membrane

IN Cao, Shuguang; Xu, Helen; Chen, Jingping

PA Polyfuel, Inc., USA

SO PCT Int. Appl., 32 pp.

CODEN: PIXXD2

DT Patent
 LA English
 FAN.CNT 6

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2003095509	A1	20031120	WO 2003-US15178	20030513 <--
	W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
	AU 2003237849	A1	20031111	AU 2003-237849	20030513 <--
	CA 2485727	AA	20031120	CA 2003-2485727	20030513 <--
	EP 1517929	A1	20050330	EP 2003-736609	20030513 <--
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
	CN 1668656	A	20050914	CN 2003-816349	20030513 <--
	JP 2006506472	T2	20060223	JP 2004-503520	20030513 <--
	US 2006135657	A1	20060622	US 2006-350228	20060207 <--
PRAI	US 2002-381136P	P	20020514	<--	
	US 2002-426540P	P	20021115		
	US 2003-446395P	P	20030210		
	US 2003-449299P	P	20030220		
	US 2003-438299	A3	20030513		
	WO 2003-US15178	W	20030513		

AB This invention relates to sulfonated copolymers for proton-conducting membranes allowing the dimensional stability of polymer electrolyte membrane over a wide temperature range and avoiding excessive membrane swelling in direct methanol fuel cells. The method for the preparation of a sulfonated polymers is included the steps of combining a first monomer having at least one sulfonate group and having at least two leaving groups with a second comonomer having at least two groups that can displace at least one leaving group of the first monomer and a third comonomer having at least two leaving groups, and a fourth comonomer having at least two displacing groups that can react with the leaving groups of either said first comonomer or said third comonomer and is used for proton exchange membranes, catalyst coated membranes and membrane electrode assembly preparation. Exampled polymer is prepared by heating of the mixture of 9.13 g

of bisphenol A, 5.67 g of 4,4'-difluorobenzophenone, 5.91 g of 4,4'-difluoro-3,3'-disulfonyl-benzophenone and 7.2 g of potassium carbonate in a mixture of DMSO and toluene at 150° for 4 h and keeping at 180° for 6 h with further precipitation with acetone or methanol. The dry polymer is dissolved in DMAc for 20% coating solution and the obtained 2 mil thick membrane is soaked in sulfuric acid for 16 h.

IC ICM C08F0016-36

CC 37-3 (Plastics Manufacture and Processing)

Section cross-reference(s): 52

IT Fuel cell electrolytes

Membranes, nonbiological

(sulfonated copolymer for polymer electrolyte membrane)

IT 625392-07-6P 625392-08-7P 625392-10-1P 625392-12-3P 625392-14-5P

625392-16-7P 625392-17-8P 625392-19-0P 625392-21-4P

625392-23-6P 625392-25-8P 625392-26-9P 625392-28-1P

625392-30-5P 625392-32-7P 625392-35-0P 625392-38-3P

RL: DEV (Device component use); IMF (Industrial manufacture); TEM
(Technical or engineered material use); PREP (Preparation); USES (Uses)
(sulfonated copolymer for polymer electrolyte membrane)

IT 625392-17-8P 625392-19-0P 625392-23-6P

RL: DEV (Device component use); IMF (Industrial manufacture); TEM
(Technical or engineered material use); PREP (Preparation); USES (Uses)
(sulfonated copolymer for polymer electrolyte membrane)

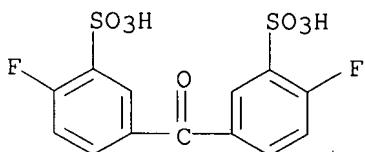
RN 625392-17-8 HCAPLUS

CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, polymer with
bis(4-fluorophenyl)methanone and 4,4'-cyclohexylidenebis[phenol] (9CI)
(CA INDEX NAME)

CM 1

CRN 625392-06-5

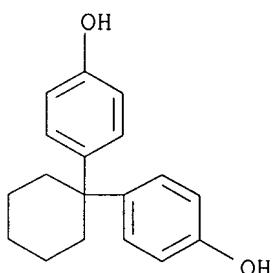
CMF C13 H8 F2 O7 S2



CM 2

CRN 843-55-0

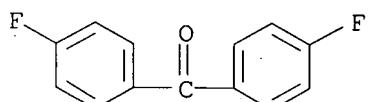
CMF C18 H20 O2



CM 3

CRN 345-92-6

CMF C13 H8 F2 O

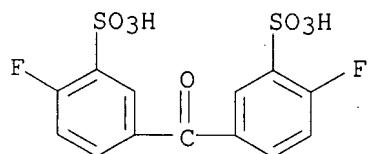


RN 625392-19-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, polymer with 4,4'-cyclohexylidenebis[phenol] and 1,1'-sulfonylbis[4-fluorobenzene] (9CI) (CA INDEX NAME)

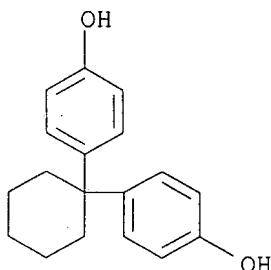
CM 1

CRN 625392-06-5
CMF C13 H8 F2 O7 S2



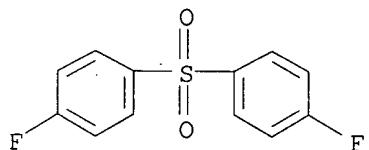
CM 2

CRN 843-55-0
CMF C18 H20 O2



CM 3

CRN 383-29-9
CMF C12 H8 F2 O2 S

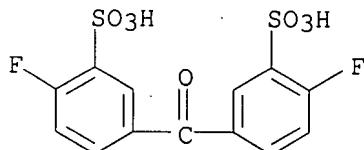


RN 625392-23-6 HCPLUS

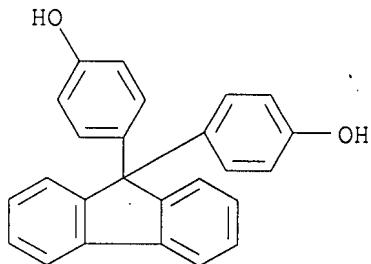
CN Benzenesulfonic acid, 3,3'-carbonylbis[6-fluoro-, polymer with bis(4-fluorophenyl)methanone and 4,4'-(9H-fluoren-9-ylidene)bis[phenol] (9CI) (CA INDEX NAME)

CM 1

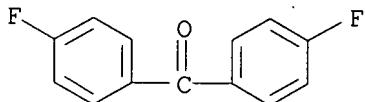
CRN 625392-06-5
CMF C13 H8 F2 O7 S2



CM 2

CRN 3236-71-3
CMF C25 H18 O2

CM 3

CRN 345-92-6
CMF C13 H8 F2 O

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Gan	2001	50	1812	Polymer International	HCAPLUS
Liu	2001	222	1579	Macromol Rapid Commu	
Liu	2001	42	3293	Polymer	HCAPLUS
McGrath	2002			US 20020091225 A1	
Wang	1998	199	1421	Macromol Chem Phys	HCAPLUS
Xiao	2002	48	1309	Polymer Bulletin	HCAPLUS

L95 ANSWER 7 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN
AN 2003:907123 HCAPLUS

DN 139:382455

TI Compositions containing acidic group-containing polybenzimidazoles and acidic group-containing polymers for adhesives and ion conductor membranes used in electrode composites of fuel cells

IN Sakaguchi, Yoshimitsu; Kitamura, Kota; Nagahara,

Shigenori

PA Toyobo Co., Ltd., Japan
 SO Jpn. Kokai Tokkyo Koho, 14 pp.
 CODEN: JKXXAF

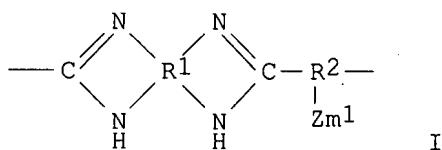
DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2003327825	A2	20031119	JP 2002-133112	20020508 <--
PRAI	JP 2002-133112		20020508	<--	

GI



AB The compns. giving polymer electrolyte membranes with high ion conductivity while

suppressing swelling in high-temperature humid state, comprise polybenzimidazoles having structural components I ($m_1 = 1-4$; $R_1 =$ imidazole ring-forming tetravalent aromatic linkage; $R_2 =$ divalent aromatic linkage; R_1 and R_2 may be single aromatic ring or linked residue or condensed ring of plural aromatic rings optionally with stable substituent; $Z =$ sulfonic acid and/or phosphonic acid residue optionally with partial salt structure) and acidic group-containing polymers. Thus, a solution of polybenzimidazole prepared from 3,3',4,4'-tetraaminodiphenylsulfone and 2,5-dicarboxybenzenesulfonic acid monosodium salt was mixed with a solution of sulfonated 9,9-bis(4-hydroxyphenyl)fluorene-bis(4-hydroxyphenyl)sulfone-4,4'-difluorodiphenylsulfone copolymer to give a mixture, which was processed to give a film showing ion conductivity (80° , 95%RH) 0.07 S/cm.

IC ICM C08L0079-04

ICS C08L0101-06; C09J0179-04; H01B0001-06; H01M0008-02; H01M0008-10

CC 38-3 (Plastics Fabrication and Uses)

Section cross-reference(s): 52, 76

IT 267877-35-0P 425636-38-0P, 2,5-Dicarboxybenzenesulfonic acid monosodium salt-3,3',4,4'-tetraaminodiphenylsulfone copolymer 426255-33-6P

RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(compns. containing acidic group-containing polybenzimidazoles and acidic group-containing polymers for fuel cell ion conductor membranes and adhesives)

IT 267877-35-0P

RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

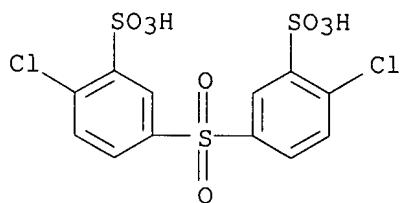
(compns. containing acidic group-containing polybenzimidazoles and acidic group-containing polymers for fuel cell ion conductor membranes and adhesives)

RN 267877-35-0 HCPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

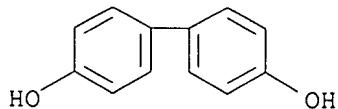
CRN 51698-33-0
 CMF C12 H8 Cl2 O8 S3 . 2 Na



● 2 Na

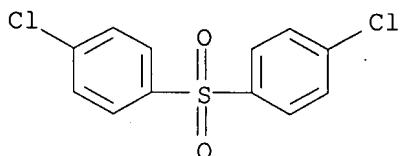
CM 2

CRN 92-88-6
 CMF C12 H10 O2



CM 3

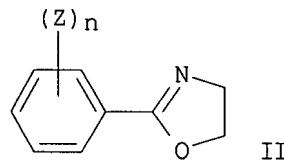
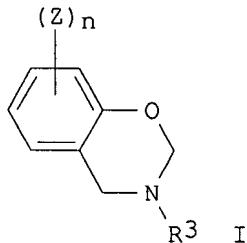
CRN 80-07-9
 CMF C12 H8 Cl2 O2 S



L95 ANSWER 8 OF 21 HCPLUS COPYRIGHT 2006 ACS on STN
 AN 2003:586587 HCPLUS
 DN 139:152288
 TI Thermally crosslinkable polymer solid electrolyte for fuel cell, polymer solid electrolyte film, and manufacture thereof
 IN Kitamura, Kota; Takase, Satoshi; Sakaguchi, Yoshimitsu; Nagahara, Shigenori; Hamamoto, Shiro; Nakao, Junko
 PA Toyobo Co., Ltd., Japan
 SO Jpn. Kokai Tokkyo Koho, 9 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2003217343	A2	20030731	JP 2002-15987	20020124 <--
PRAI	JP 2002-15987		20020124	<--	
GI					



AB The thermally crosslinkable polymer solid electrolyte has ≥ 1 ionic group and ≥ 1 thermally crosslinkable group in the mol. The ionic group may be sulfonic acid or phosphonic acid group. Thermally crosslinkable group may be $-C_6H_4(Z)n-C.tplbond.R1$, $-C_6H_4(Z)n-OCH_2-C.tplbond.R2$, I $-C_6H_4(Z)n-CR_6=CR_5$, $CH_2-CR_9=CR_8R_7$, or II ($Z = mH$, C_{12-10} hydrocarbon, halo, etc.; $R1-9 = H$, C_{1-10} alkyl, Ph, etc.; $X = H$, monovalent metal ion; and $n =$ integer 1-4). The polymer backbone chain may be polyethersulfone or polyether ketone.

IC ICM H01B0001-06
 ICS C08G0065-40; C08G0075-23; C08J0005-22; H01B0013-00; H01M0008-02;
 H01M0008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 35, 38

IT **569346-21-0DP**, Disodium 4,4'-dichlorodiphenylsulfone-3,3'-disulfonate-4,4'-dichlorodiphenylsulfone-biphenol copolymer, reaction product with 4-ethynylphenol
 RL: PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (crosslinked; thermally crosslinkable polymer solid electrolyte for fuel cell)

IT **569346-21-0DP**, Disodium 4,4'-dichlorodiphenylsulfone-3,3'-disulfonate-4,4'-dichlorodiphenylsulfone-biphenol copolymer, reaction product with 4-ethynylphenol
 RL: PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (crosslinked; thermally crosslinkable polymer solid electrolyte for fuel cell)

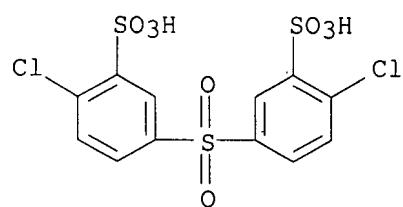
RN 569346-21-0 HCPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-ar,ar'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

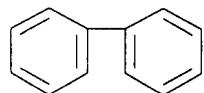
CMF C12 H8 C12 O8 S3 . 2 Na



●2 Na

CM 2

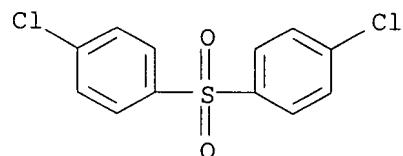
CRN 26983-52-8
 CMF C12 H10 O2
 CCI IDS



2 (D1-OH)

CM 3

CRN 80-07-9
 CMF C12 H8 Cl2 O2 S



L95 ANSWER 9 OF 21 HCPLUS COPYRIGHT 2006 ACS on STN
 AN 2003:319959 HCPLUS
 DN 138:339060
 TI Crosslinkable aromatic resins having protonic acid groups, and ion conductive polymer membranes, binders, and fuel cells made by using the same
 IN Ishikawa, Junichi; Kuroki, Takashi; Fujiyama, Satoko; Omi, Takehiko; Nakata, Tomoyuki; Okawa, Yuichi; Miyazaki, Kazuhisa; Fujii, Shigeharu; Tamai, Shoji
 PA Mitsui Chemicals, Inc., Japan
 SO PCT Int. Appl., 132 pp.
 CODEN: PIXXD2

DT Patent
 LA Japanese
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2003033566	A1	20030424	WO 2002-JP10536	20021010 <--
	W: CA, CN, IN, JP, KR, US				
	RW: DE, FR, GB, IT, SE				
	TW 236486	B1	20050721	TW 2002-91123279	20021009 <--
	CA 2463429	AA	20030424	CA 2002-2463429	20021010 <--
	EP 1457511	A1	20040915	EP 2002-775319	20021010 <--
	R: DE, FR, GB, IT, SE, SI, LT, LV, RO, MK, AL				
	CN 1630676	A	20050622	CN 2002-820224	20021010 <--
	US 2004191602	A1	20040930	US 2004-820842	20040409 <--
PRAI	JP 2001-312799	A	20011010	<--	
	JP 2002-182252	A	20020621	<--	
	WO 2002-JP10536	W	20021010	<--	
AB	The invention relates to (A) a crosslinkable aromatic resin which has crosslinking groups and protonic acid groups and is suitable for electrolyte membranes and binders for fuel cells, (B) polymeric electrolyte membranes and binders for fuel cells, made by using the resin, and (C) fuel cells made by using the membranes or the binders. The aromatic resin has crosslinking groups which are not derived from protonic acid groups and are capable of causing crosslinking without the formation of a leaving component, and exhibits excellent ionic conductivity, heat resistance, water resistance, and adhesion, and low methanol permeability. It is preferable that the aromatic resin bears as the crosslinking groups both C1-10 alkyl bonded directly to an aromatic ring and carbonyl or carbon-carbon double or triple bonds, while preferred examples of the crosslinkable aromatic resin include aromatic polyether, aromatic polyamide, aromatic polyimide, aromatic polyamide-imide, and aromatic polyazole, each of which has crosslinking				
	groups described above. Thus, 5,5'-carbonylbis(sodium 2-fluorobenzenesulfonate) obtained from 0.525 mol 4,4'-difluorobenzophenone and 210 mL 50% sulfuric acid 4.22, 4,4'-difluorobenzophenone 2.18, and 2,2-bis(3,5-dimethyl-4-hydroxyphenyl)propane 5.69 g were reacted at 160° for 4 h in the presence of potassium carbonate to give 10.39 g polyether ketone powder with reduced viscosity 0.85 dL/g, glass transition temperature 230°, and 5% weight loss temperature 367°, which was applied on a glass and dried at 200° for 4 h to give a membrane with conductivity 0.018 S/cm at 30° and 0.065 S/cm at 90°.				
IC	ICM C08G0065-40				
	ICS C08G0069-48; C08G0073-10; C08J0005-22; H01M0008-02				
CC	37-3 (Plastics Manufacture and Processing)				
IT	Section cross-reference(s): 38, 52				
IT	Membranes, nonbiological				
	(ionic conductive; preparation of crosslinkable aromatic resins having protonic				
	acid groups for ion conductive polymer membranes, binders, and fuel cells)				
IT	24938-67-8DP, Poly(2,6-dimethyl-1,4-phenylene oxide), sodium sulfonated 267877-35-0DP, reaction products with ethenylphenol				
	515144-26-0P 515144-27-1P 515144-28-2P 515144-29-3P 515144-30-6P				
	515144-31-7P 515144-32-8P 515144-33-9P 515144-60-2P 515144-61-3P				
	515144-62-4P 515144-64-6DP, sulfonated 515144-65-7DP, sulfonated 515811-98-0P				
	RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)				

for (preparation of crosslinkable aromatic resins having protonic acid groups

ion conductive polymer membranes, binders, and fuel cells)

IT 267877-35-0DP, reaction products with ethenylphenol

RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or
engineered material use); PREP (Preparation); USES (Uses)

for (preparation of crosslinkable aromatic resins having protonic acid groups

ion conductive polymer membranes, binders, and fuel cells)

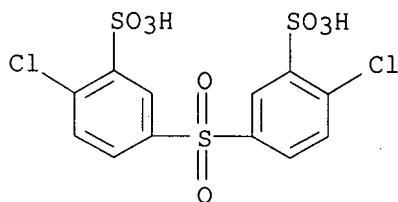
RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer
with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI)
(CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

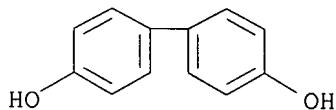


●2 Na

CM 2

CRN 92-88-6

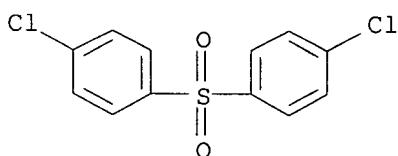
CMF C12 H10 O2



CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Commissariat A L'Energi	2001			WO 0125312 A	HCAPLUS
Commissariat A L'Energi	2001			JP 2000510511 A	
Commissariat A L'Energi	2001			US 200120082 A	
Commissariat A L'Energi	2001			FR 2799198 A	HCAPLUS
Hoechst Ag	1999			JP 11-502245 A	
Hoechst Ag	1999			WO 9629359 A	HCAPLUS
Kaneka Corp	2002			JP 2002105199 A	HCAPLUS
Kaneka Corp	2002			JP 2002121281 A	HCAPLUS
Sumitomo Electric Indus	2002			JP 2002358978 A	HCAPLUS
Sumitomo Electric Indus	2002			JP 2002367627 A	HCAPLUS
Victrex Manufacturing L	2000			WO 0015691 A	HCAPLUS
Victrex Manufacturing L	2000			JP 2002524631 A	

L95 ANSWER 10 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 2003:33836 HCAPLUS

DN 138:90987

TI Heat-resistant, ion-conductive aromatic polyethers and their moldings and films

IN Kitamura, Kota; Tatemori, Hiroshi; Sakaguchi, Yoshimitsu
; Hamamoto, Shiro; Nakao, Junko; Takase, Satoshi

PA Toyobo Co., Ltd., Japan

SO Jpn. Kokai Tokkyo Koho, 8 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI JP 2003012795	A2	20030115	JP 2002-113686	20020416 <--
PRAI JP 2001-126196	A	20010424	<--	

AB The aromatic polyethers, useful for polymer electrolytes, are prepared by polymerizing substantially equimolar blends of divalent phenols with dihalogenobenzenoid compds. in organic high-polar solvents in the presence of alkali metal **carbonates** and/or **bicarbonates**, wherein the polyethers have on o-position of ether bonds ≥ 0.1 -equivalent (on ether bonds) acidic groups and other substituents. Thus, 3,3'-disulfo-4,4'-dichlorodiphenyl sulfone disodium salt 2.456, 4,4'-dichlorodiphenyl sulfone 2.783, and 3,3'-dimethyl-4,4'-dihydroxydiphenyl sulfone 2.783 g were copolymerd. at 190° in PhMe in the presence of K₂CO₃ to give a polymer with intrinsic viscosity (0.5 g/dL NMP, 30°) 0.23 dL/g, T_g 230°, and ion-exchange equivalent 1.43 mmol/g, water absorption of the film 31% after 1 days in distilled water at room temperature

IC ICM C08G0065-40

ICS C08J0005-00; C08L0071-08

CC 38-3 (Plastics Fabrication and Uses)

Section cross-reference(s): 52

IT Heat-resistant materials

Ion exchange membranes

(heat-resistant, ion-conductive aromatic polyethers and their moldings and films)

IT 483995-29-5P 483995-32-0P **483995-35-3P** 483995-39-7P

483995-42-2P 483995-45-5P 483995-47-7P 483995-50-2P

RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(heat-resistant, ion-conductive aromatic polyethers and their moldings and films)

IT 483995-35-3P

RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (heat-resistant, ion-conductive aromatic polyethers and their moldings and films)

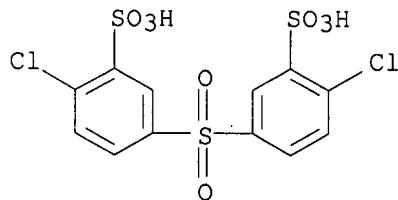
RN 483995-35-3 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[3,4-dichlorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

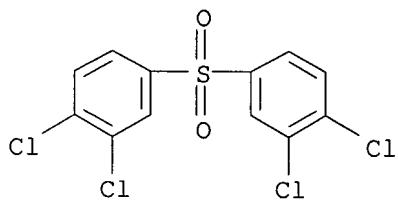


●2 Na

CM 2

CRN 22588-79-0

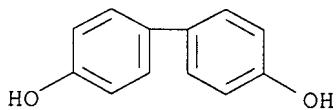
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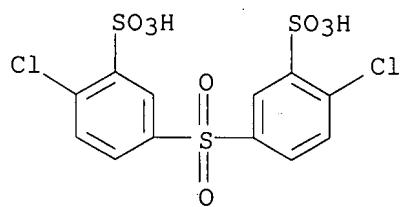
CM 3

CRN 92-88-6

CMF C12 H10 O2



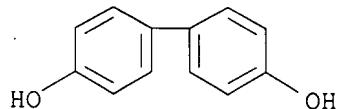
L95 ANSWER 11 OF 21 HCPLUS COPYRIGHT 2006 ACS on STN
AN 2002:281429 HCPLUS
DN 137:79794
TI Proton exchange membrane nanocomposites
AU Hickner, Michael A.; Kim, YuSeung; Wang, Feng; McGrath, James E.;
Zawodzinski, Thomas A.
CS Department of Chemistry and Materials Research Institute, Virginia
Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SO Proceedings of the American Society for Composites, Technical Conference (2001), 16th, 323-336
CODEN: PAMTEG; ISSN: 1084-7243
PB CRC Press LLC
DT Journal; (computer optical disk)
LA English
AB Polymeric membrane nanocomposites incorporating phosphotungstic acid were synthesized as candidates for fuel cell proton exchange membranes. The matrix polymers for the nanocomposites were sulfonated poly(arylene ether sulfone)s. The main goal of this research is to improve upon purely polymeric proton exchange membranes and allow the fuel cell to be run at temps. greater than 100°C. The phosphotungstic acid serves to improve the protonic conductivity of the membrane while decreasing the water absorption. This is a surprising result, as with most sulfonic acid-base membranes, protonic conductivity has been directly related to membrane water content. In addition, the inorg. filler also improves the modulus of the material.
CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 35, 37, 52
IT **Membranes, nonbiological**
(composite; proton exchange membrane nanocomposites of sulfonated poly(arylene ether sulfone)s/phosphotungstic acid)
IT **267877-35-0DP, hydrolyzed**
RL: POF (Polymer in formulation); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(proton exchange membrane nanocomposites of sulfonated poly(arylene ether sulfone)s/phosphotungstic acid)
IT **267877-35-0DP, hydrolyzed**
RL: POF (Polymer in formulation); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(proton exchange membrane nanocomposites of sulfonated poly(arylene ether sulfone)s/phosphotungstic acid)
RN 267877-35-0 HCPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)
CM 1
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

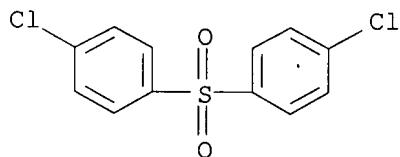
CM 2

CRN 92-88-6
 CMF C12 H10 O2



CM 3

CRN 80-07-9
 CMF C12 H8 Cl2 O2 S



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG. (RPG)	Referenced Work (RWK)	Referenced File
Alberti, G	2001	185	73	J Memb Sci	HCAPLUS
Malhotra, S	1997	144	L23	J Electrochem Soc	HCAPLUS
Park, M	1996	64	743	Denki Kagaku	HCAPLUS
Savinell, R	1998	98-27	81	Electrochem Soc Proc	
Steck, A	1997			Presented at the New	
Thomas, S	1999			Fuel Cells - Green P	
Wang, F	2001			J Memb Sci, submitte	
Wang, F	2000			Macromol Symp, accep	
Zaidi, S	2000	173	17	J Memb Sci	HCAPLUS
Zawodzinski, T	1991	95	6040	J Phys Chem	HCAPLUS

L95 ANSWER 12 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN
 AN 2002:241166 HCAPLUS
 DN 136:265821

TI Ion-conducting sulfonated polymeric materials
 IN McGrath, James E.; Hickner, Michael; Wang, Feng; Kim, Yu-Seung
 PA Virginia Tech Intellectual Properties, Inc., USA
 SO PCT Int. Appl., 46 pp.
 CODEN: PIXXD2

DT Patent
 LA English
 FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2002025764	A1	20020328	WO 2001-US29293	20010920 <--
	W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
	CA 2421627	AA	20020328	CA 2001-2421627	20010920 <--
	AU 2001092804	A5	20020402	AU 2001-92804	20010920 <--
	EP 1327278	A1	20030716	EP 2001-973199	20010920 <--
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
	JP 2004509224	T2	20040325	JP 2002-528869	20010920 <--
PRAI	US 2000-234177P	P	20000920	<--	
	WO 2001-US29293	W	20010920	<--	

AB Sulfonated polymers are made by the direct polymerization of a sulfonated monomer

to form the sulfonated polymers. The types of sulfonated polymers may include polysulfones or polyimides. The sulfonated polymers can be formed into **membranes** that may be used in proton **exchange membrane** fuel cells or as **ion exchange membranes**. The **membranes** formed from the sulfonated polymers exhibit improved properties over that of Nafion. A heteropoly acid may be added to the sulfonated polymer to form a nanocomposite **membrane** in which the heteropoly acid is highly dispersed. The addition of a heteropoly acid to the sulfonated polymer increases the thermal stability of the **membrane**, enhances the conductivity above 100°, and reduces the water uptake of the **membrane**.

IC ICM H01M0008-10
 ICS C08G0069-26; C08G0075-00
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 37
 ST fuel cell **membrane** sulfonated polymer heteropoly acid nanocomposite; **ion exchange membrane** sulfonated polymer heteropoly acid nanocomposite
 IT **Ion exchange membranes**
 (ion-conducting sulfonated polymeric materials)
 IT Fuel cells
 (proton **exchange membrane**; ion-conducting sulfonated polymeric materials)
 IT 267877-35-0P 302924-87-4DP, proton exchanged derivs.
 302924-87-4P
 RL: DEV (Device component use); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (ion-conducting sulfonated polymeric materials)
 IT 267877-35-0P
 RL: DEV (Device component use); SPN (Synthetic preparation); TEM

(Technical or engineered material use); PREP (Preparation); USES (Uses)
(ion-conducting sulfonated polymeric materials)

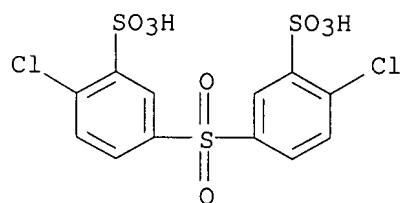
RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer
with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI)
(CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

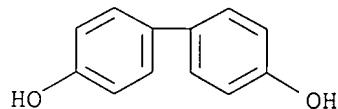


●2 Na

CM 2

CRN 92-88-6

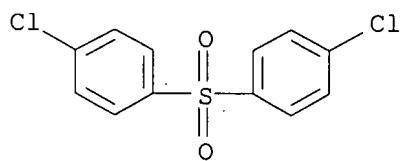
CMF C12 H10 O2



CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Aisin Aw Co Ltd	1997			JP 09245818	HCAPLUS
Mecham, J	2000	41	1388	Polym Prepr	HCAPLUS

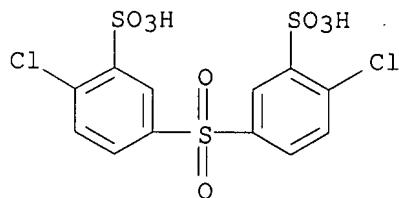
Miller | 1993 | | US 5272217 A | HCAPLUS

L95 ANSWER 13 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN
 AN 2002:230184 HCAPLUS
 DN 137:20681
 TI Synthesis and characterization of controlled molecular weight poly(arylene ether sulfone) copolymers bearing sulfonate groups by end-group analysis
 AU Wang, Feng; Glass, Thomas; Li, Xinyu; Hickner, Michael; Kim, YuSeung; McGrath, James
 CS Dep. Chem. Material Inst., Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, 24061, USA
 SO Polymer Preprints (American Chemical Society, Division of Polymer Chemistry) (2002), 43(1), 492-493
 CODEN: ACPPAY; ISSN: 0032-3934
 PB American Chemical Society, Division of Polymer Chemistry
 DT Journal; (computer optical disk)
 LA English
 AB Copolymer of 4,4'-biphenol 4,4'-dichlorodiphenyl sulfone 3,3'-disulfonated 4,4'-dichlorodiphenyl sulfone was end-capped with 4-tert-butylphenol. The mol. weight and chemical composition characterization of sulfonated poly(arylene ether sulfone)s by the combination of quant. end capping and NMR techniques.
 CC 35-5 (Chemistry of Synthetic High Polymers)
 IT 98-54-4DP, 4-tert-Butylphenol, reaction product with 4,4'-biphenol-4,4'-dichlorodiphenyl sulfone-3,3'-disulfonated 4,4'-dichlorodiphenyl sulfone copolymer **267877-35-0DP**, reaction product with 4-tert-Butylphenol
 RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation) (synthesis and characterization of controlled mol. weight poly(arylene ether sulfone) copolymers bearing sulfonate groups by end-group anal.)
 IT **267877-35-0DP**, reaction product with 4-tert-Butylphenol
 RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation) (synthesis and characterization of controlled mol. weight poly(arylene ether sulfone) copolymers bearing sulfonate groups by end-group anal.)
 RN 267877-35-0 HCAPLUS
 CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

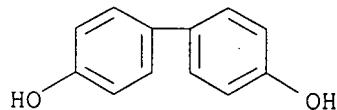
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

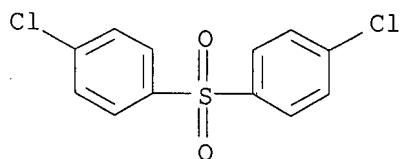
CM 2

CRN 92-88-6
 CMF C12 H10 O2



CM 3

CRN 80-07-9
 CMF C12 H8 Cl2 O2 S



RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Dumais, J	1986	19	1884	Macromolecules	HCAPLUS
Gary, F	1997			Polymer Electrolytes	
Gunduz, N	2001			Ph D Thesis, Virginii	
Jurek, M	1989	30	978	Polymer	
McGrath, J	1981		327	ACS Symposium Series	
McGrath, J	1984	22	721	J of Polym Sci	
McGrath, J	1983	1	347	Physicochemical Aspe	
Noshay, A	1976	20	1885	J of Appl Polym Sci	HCAPLUS
Wang, F	2001			J of Membr Sci, in p	
Wang, F	1998	199	1421	Macromol Chem and Ph	HCAPLUS
Wang, F	2001			Macromolecular Sympo	
Wang, F	1999	40	795	Polymer	HCAPLUS
Wang, F	2000	41	1401	Polymer Preprint	HCAPLUS
Wang, F	2000	41	237	Polymer preprints	HCAPLUS
Wang, F	2001	85	1517	Polymeric Materials:	HCAPLUS
Wang, F	2001	84	1913	Polymeric Materials:	HCAPLUS

L95 ANSWER 14 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 2002:93463 HCAPLUS

DN 136:310780

TI Direct polymerization of sulfonated poly(arylene ether sulfone) random (statistical) copolymers: candidates for new proton exchange membranes

AU Wang, Feng; Hickner, Michael; Kim, Yu Seung; Zawodzinski, Thomas A.; McGrath, James E.

CS Department of Chemistry and Materials Research Institute, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA

SO Journal of Membrane Science (2002), 197(1-2), 231-242

CODEN: JMESDO; ISSN: 0376-7388

PB Elsevier Science B.V.

DT Journal
 LA English
 AB Novel biphenol-based wholly aromatic poly(arylene ether sulfone)s containing up to two pendant sulfonate groups per repeat unit were prepared by potassium **carbonate** mediated direct aromatic nucleophilic substitution polycondensation of disodium 3,3'-disulfonate-4,4'-dichlorodiphenylsulfone (SDCDPS), 4,4'-dichlorodiphenylsulfone (DCDPS) and 4,4'-biphenol. Copolymer proceeded quant. to high mol. weight in N-methyl-2-pyrrolidinone at 190 °C. Tough **membranes** with a SDCDPS/DCDPS mole ratio up to 60:40 were successfully cast using N,N-dimethylacetamide. An increase of sulfonate groups in the copolymer resulted in increased glass transition temperature, enhanced **membrane** hydrophilicity, and intrinsic viscosity; the 100% SDCDPS homopolymer was water soluble. The acid form **membranes** were successfully obtained by treating the sodium form of the **membranes** with dilute sulfuric acid solution. Thermogravimetric anal. shows that the sodium form materials have enhanced thermal stability relative to the acid form, as expected. Atomic force microscopy (AFM) phase images of the acid form **membranes** clearly show the hydrophilic domains, with sizes increasing from 10 to 25 nm as a function of the degree of sulfonation. A phase inversion could be observed for the 60% SCSDPS copolymer, which was consistent with a rapid increase in water absorption. Short-term aging (30 min) indicates that the desired acid form **membranes** are stable to 220 °C in air and conductivity values at 30 °C of 0.11 S/cm (SDCDPS/DCDPS=0.4) and 0.17 S/cm (SDCDPS/DCDPS=0.6) were measured, which are comparable to or higher than the state-of-the-art fluorinated copolymer Nafion 1135 control (0.12 S/cm). The conductivity is greatly influenced by **ion exchange** capacity, temperature, and water activity. The new copolymers, which contain **ion** conductivity sites on the deactivated positions of the aryl backbone rings, are candidates as new polymeric electrolyte materials for proton **exchange membrane** (PEM) fuel cells.

CC 38-3 (Plastics Fabrication and Uses)
 Section cross-reference(s): 35

ST nucleophilic substitution polycondensation disodium disulfonatodichlorodiphenylsulfone dichlorodiphenylsulfone biphenol potassium **carbonate**; polyether polysulfone membrane prepn

IT Electric conductivity
 Glass transition temperature
Membranes, nonbiological
 Thermal stability
 Viscosity
 (preparation, thermal, elec., and rheolog. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange membranes)

IT 584-08-7, Potassium **carbonate**
 RL: CAT (Catalyst use); USES (Uses)
 (preparation, thermal, elec., and rheolog. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange membranes)

IT 267877-35-0P
 RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); RACT (Reactant or reagent); USES (Uses)
 (preparation, thermal, elec., and rheolog. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange membranes)

IT 267877-35-0DP, hydrolyzed
 RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (preparation, thermal, elec., and rheolog. properties of sulfonated

poly(arylene ether sulfone) as candidates for new proton exchange membranes)

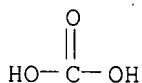
IT 584-08-7, Potassium carbonate

RL: CAT (Catalyst use); USES (Uses)

(preparation, thermal, elec., and rheolog. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange membranes)

RN 584-08-7 HCPLUS

CN Carbonic acid, dipotassium salt (8CI, 9CI) (CA INDEX NAME)



●2 K

IT 267877-35-0P

RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); RACT (Reactant or reagent); USES (Uses)
(preparation, thermal, elec., and rheolog. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange membranes)

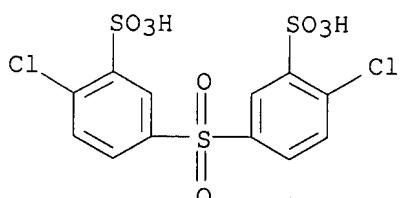
RN 267877-35-0 HCPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

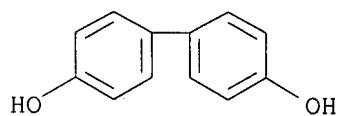


●2 Na

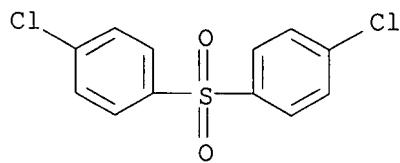
CM 2

CRN 92-88-6

CMF C12 H10 O2



CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S

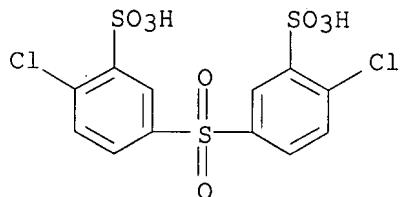
IT 267877-35-0DP, hydrolyzed

RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation, thermal, elec., and rheolog. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange membranes)

RN 267877-35-0 HCPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI)
(CA INDEX NAME)

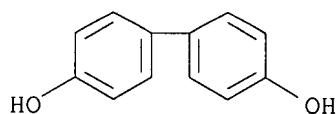
CM 1

CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na

●2 Na

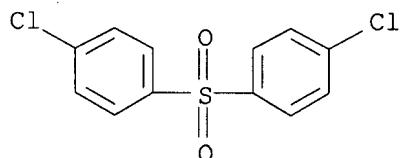
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

CRN 80-07-9
 CMF C12 H8 Cl2 O2 S



RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Appleby, A	1999		72	Sci Am	
Cotter, R	1995			A Handbook of Polyar	
Dinno, M	1983	1	347	Physicochemical Aspe	HCAPLUS
Dumais, J	1986	19	1884	Macromolecules	HCAPLUS
Genies, C	2001	42	359	Polymer	HCAPLUS
Gieke, T	1981	19	1687	J Polym Sci, Polym P	
Gunduz, N	2000	41	1565	Polym Preprints	HCAPLUS
Hedrick, J	1986	23	287	J Polym Sci, Polym C	
Jacoby, M	1999	77	31	C&E News	
Johnson, B	1984	22	721	J Polym Sci	HCAPLUS
Johnson, R	1967	5	2375	J Polym Sci, Polym C	HCAPLUS
Kerres, J	1996	34	2421	J Polym Sci	HCAPLUS
Kopitzke, R	2000	147	1667	J Electrochem Soc	
Leung, L	1987	28	20	Polym Commun	HCAPLUS
Lloyd, D	1981	152	327	ACS Symp Ser	
McGrath, J	1999			ACS Symp Ser	
Miyatake, K	1996	29	6969	Macromolecules	HCAPLUS
Noshay, A	1976	20	1885	J Appl Polym Sci	HCAPLUS
O'Gara, J	1987	25	1519	J Polym Sci Part B	HCAPLUS
Robeson, L	1983			US 4380598	HCAPLUS
Robeson, L	1978	4	405	Molecular Basis for	HCAPLUS
Sakurai, K	1993	26	208	Macromolecules	HCAPLUS
Shobha, H	2000	40	180	Polym Preprints	
Springer, T	1991	138	2334	J Electrochem Soc	HCAPLUS
Tran, C	1980			Thesis Virginia Poly	
Ueda, M	1993	31	85	J Polym Sci, Polym C	
Viswanathan, R	1984	25	1827	Polymer	HCAPLUS
Wang, F	1999	55	871	Acta Crystallogr, C:	
Wang, F	1998	199	1421	Macromol Chem Phys	HCAPLUS
Wang, F	2001			Macromol Symp in pre	
Wang, F	2000	40	180	Polym Preprints	
Wang, F	2000	40	237	Polym Preprints	
Wang, F	1999	40	795	Polymer	HCAPLUS
Wang, S	2001			Review on Poly(aryle	

Xue, Y	1997	30	3803	Macromolecules	HCAPLUS
Zaidi, S	2000	173	17	J Membr Sci	HCAPLUS
Zawodzinski, T	1993	140	1981	J Electrochem Soc	HCAPLUS

L95 ANSWER 15 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN
 AN 2001:846076 HCAPLUS

DN 136:102739

TI Synthesis of highly sulfonated poly(arylene ether sulfone) random (statistical) copolymers via direct polymerization

AU Wang, Feng; Hickner, Michael; Ji, Qing; Harrison, William; Mecham, Jeffrey; Zawodzinski, Thomas A.; McGrath, James E.

CS Department of Chemistry and Materials Research Institute (0344), Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA

SO Macromolecular Symposia (2001), 175(Polymerization Processes and Polymer Materials II), 387-395

CODEN: MSYMEC; ISSN: 1022-1360

PB Wiley-VCH Verlag GmbH

DT Journal

LA English

AB Novel biphenol-based wholly aromatic poly (arylene ether sulfones) containing pendant sulfonate groups were prepared by direct aromatic nucleophilic substitution polycondensation of disodium 3,3'-disulfonate-4,4'-dichlorodiphenyl sulfone (SDCDPS), 4,4'-dichlorodiphenylsulfone (DCDPS) and biphenol. Copolymn. proceeded quant. to high mol. weight in N-methyl-2-pyrrolidinone at 190°C in the presence of anhydrous potassium **carbonate**. Tough **membranes** were successfully cast from the control and the copolymers, which had a SDCDPS/DCDPS mole ratio of either 40:60 or 60:40 using N,N-dimethylacetamide; the 100% SDCDPS homopolymer was water soluble. Short-term aging (30 min) indicates that the desired acid form **membranes** are stable to 220°C in air and conductivity values at 25°C of 0.110 (40%) and 0.170 S/cm (60%) were measured, which are comparable to or higher than the state-of-the art fluorinated copolymer Nafion 1135 control. The new copolymers, which contain **ion** conductivity sites on deactivated rings, are candidates as new polymeric electrolyte materials for proton **exchange membrane** (PEM) fuel cells. Further research comparing their **membrane** behavior to post-sulfonated systems is in progress.

CC 35-5 (Chemistry of Synthetic High Polymers)

IT 267877-35-0DP, reaction products with acids 389600-31-1DP, reaction products with acids

RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation) (synthesis of highly sulfonated poly(arylene ether sulfone) via direct polymerization)

IT 267877-35-0DP, reaction products with acids

RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation) (synthesis of highly sulfonated poly(arylene ether sulfone) via direct polymerization)

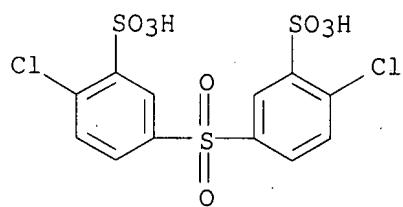
RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

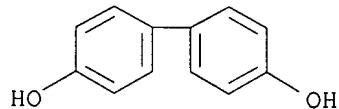
CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

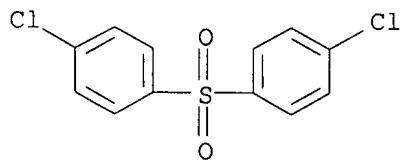


●2 Na

CM 2

CRN 92-88-6
CMF C12 H10 O2

CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Anon				Macromolecules in pr	
Applby, A	1999			Sci American	
Dinno, M	1983	1	347	Physicochemical Aspe	HCAPLUS
Dumais, J	1986	19	1884	Macromolecules	HCAPLUS
Gunduz, N	2000	41	1565	Polymer Preprints	HCAPLUS
Jacoby, M	1999	77	31	C&E News	
Johnson, B	1984	22	721	J of Polym Sci	HCAPLUS
Kopitzke, R	2000	147	1677	Journal of The Elect	HCAPLUS
Lloyd, D	1981		327	ACS Symposium Series	
McGrath, J	1999			ACS Symposium	
Mercier, R	1999			Fifth European Techn	
Noshay, A	1976	20	1885	J of Appl Polym Sci	HCAPLUS
Robeson, L	1983			US 4380598	HCAPLUS
Robeson, L	1978	4	405	Molecular Basis for	HCAPLUS

Shobha, H	12000	40	180	Polymer Preprints	
Springer, T	1991	138	2334	Journal of The Elect	HCAPLUS
Tran, C	1980			Thesis Virginia Poly	
Udea, M	1993	31	85	J Polym Sci, Polym C	
Wang, F	2000	40	180	Polymer Preprints	
Wang, F	2000	40	237	Polymer Preprints	

L95 ANSWER 16 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 2001:585306 HCAPLUS

DN 135:360132

TI Heteropolyacid/sulfonated poly(arylene ether sulfone) composites for proton exchange membranes fuel cells

AU Kim, Yu Seung; Wang, Feng; Hickner, Michael; Zawodzinski, Tom A.; McGrath, James E.

CS Department of Chemistry and Material Research Institute, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA

SO Polymeric Materials Science and Engineering (2001), 85, 520-521
CODEN: PMSEDG; ISSN: 0743-0515

PB American Chemical Society

DT Journal

LA English

AB The preparation of composite membranes for use as proton exchange membranes in fuel cells at high temps. involves the incorporation of the solid heteropolyacid (hpa), H3PW12O40, in a poly(arylene ether sulfone) containing pendant sulfo groups. The poly(arylene ether sulfone) is prepared by reacting 4,4'-dichlorodiphenyl sulfone, 3,3'-diodoisulfo-4,4'-dichlorodiphenyl sulfone and 4,4'-biphenol. The HPA extraction behavior, morphol., thermal and mech. properties, and proton conduction at elevated temperature of the composite membrane are discussed.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 35

IT **Membranes, nonbiological**

(composite; proton exchange membranes from heteropolyacid and sulfonated poly(arylene ether sulfone) for fuel cells)

IT **267877-35-0DP, hydrolyzed**

RL: SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(composites, membranes; proton exchange membranes from heteropolyacid and sulfonated poly(arylene ether sulfone) for fuel cells)

IT **267877-35-0DP, hydrolyzed**

RL: SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(composites, membranes; proton exchange membranes from heteropolyacid and sulfonated poly(arylene ether sulfone) for fuel cells)

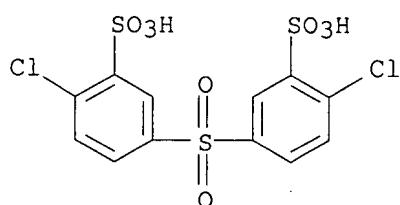
RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

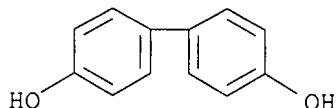
CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

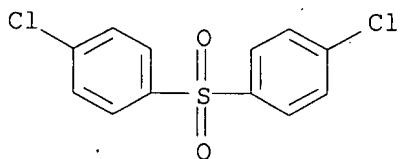


●2 Na

CM 2

CRN 92-88-6
CMF C12 H10 O2

CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Johnson, B	1984	22	721	J Polym Sci	HCAPLUS
McGrath, J	1999			ACS Symposium	
Nolte, R	1993		183	J Memb Sci	
Savadogo, O	1998	1	66	J New Mater Electroc	
Wang, F	2001			Macromot Symp in pre	
Wang, F	2000	41	237	Polymer Preprints	HCAPLUS
Wang, F	2001			Submitted for public	
Zaidi, S	2000	173	17	J Memb Sci	HCAPLUS

L95 ANSWER 17 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 2000:594001 HCAPLUS

DN 133:296766

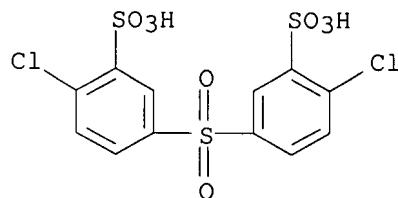
TI Synthesis and characterization of controlled molecular weight sulfonated amino-functional poly(arylene ether sulfone)s prepared by direct

AU polymerization
 CS Mecham, J.; Shobha, H. K.; Wang, F.; Harrison, W.; McGrath, J. E.
 Department of Chemistry and Center for High Performance Polymeric
 Adhesives and Composites (0344), Virginia Polytechnic Institute and State
 University, Blacksburg, VA, 24061, USA
 SO Polymer Preprints (American Chemical Society, Division of Polymer
 Chemistry) (2000), 41(2), 1388-1389
 CODEN: ACPPAY; ISSN: 0032-3934
 PB American Chemical Society, Division of Polymer Chemistry
 DT Journal
 LA English
 AB Controlled mol. weight sulfonated poly(arylene ether sulfone)s were prepared by
 direct polymerization of the sulfonated dihalide using typical polysulfone
 polymerization conditions. Reaction temps. of 190° were needed to ensure
 the polymer remained in solution throughout the reaction. The
 4,4'-dichlorodiphenylsulfone (DCDPS) with fuming sulfuric acid (SO3 28%),
 isolated with NaCl, neutralized with NaOH, and finally isolated with NaCl.
 The electrophilic aromatic substitution reaction sulfonates DCDPS meta to the
 sulfonyl group and ortho to the chlorine group. Polymerization involved
 condensation of m-aminophenol with SDCDPS and biphenol in NMP, with
 toluene as an azeotroping agent. These materials can be used as
 macromonomers in poly(imide) segmented copolymer reactions and as proton
 exchange membranes for fuel cells.
 CC 35-5 (Chemistry of Synthetic High Polymers)
 IT 591-27-5DP, m-Aminophenol, reaction products with sulfo group-containing
 polyether-polysulfones **267877-35-0DP**, m-aminophenol end-capped
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of sulfonated dichlorodiphenylsulfone and of controlled mol.
 weight amino-terminated sulfonated poly(arylene ether sulfone)s)
 IT **267877-35-0DP**, m-aminophenol end-capped
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of sulfonated dichlorodiphenylsulfone and of controlled mol.
 weight amino-terminated sulfonated poly(arylene ether sulfone)s)
 RN 267877-35-0 HCPLUS
 CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer
 with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI)
 (CA INDEX NAME)

CM 1

CRN 51698-33-0

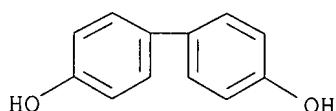
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

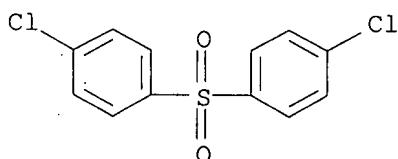
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S



RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (R WK)	Referenced File
Applby, A	1999		72	Sci American	
Dumais, J	1986	19	1884	Macromolecules	HCAPLUS
Jacoby, M	1999	31	71	C&E News	
McGrath, J	1984	22	721	J of Polym Sci	
McGrath, J	1981	153	327	Poly(aryl ether) Mem	
McGrath, J	2000	41		Polymer Preprints	
Noshay, A	1976	20	1885	J of Appl Poly Sci	HCAPLUS
Robeson, L	1978	4	405	Dynamic Mechanical C	HCAPLUS
Ueda, M	1993	31	185	J Polym Sci, Poly Ch	

L95 ANSWER 18 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 2000:208130 HCAPLUS

DN 132:334953

TI Synthesis of sulfonated poly(arylene ether sulfone)s via direct polymerization

AU Wang, F.; Ji, Q.; Harrison, W.; Mecham, J.; Formato, R.; Kovar, R.; Osenar, P.; McGrath, J. E.

CS Department of Chemistry and NSF Science and Technology Center on High Performance Polymeric Adhesives and Composites (0344), Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA

SO Polymer Preprints (American Chemical Society, Division of Polymer Chemistry) (2000), 41(1), 237-238

CODEN: ACPPAY; ISSN: 0032-3934

PB American Chemical Society, Division of Polymer Chemistry

DT Journal

LA English

AB 4,4'-Biphenol was copolymerd. with 4,4'-dichlorodiphenyl sulfone and di-Na 3,3'-sulfonylbis(6-chlorobenzenesulfonate) at 190° to provide hydrophilic sulfonated aromatic polyether-polysulfones of intrinsic viscosity 0.73-1.3 (N-methylpyrrolidone, 25°) in 90-93% yields.

CC 35-5 (Chemistry of Synthetic High Polymers)

IT **267877-35-0P**, 4,4'-Biphenol-4,4'-dichlorodiphenyl sulfone-disodium 3,3'-sulfonylbis(6-chlorobenzenesulfonate) copolymer
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of hydrophilic aromatic sulfonated polyether-polysulfones)

IT **267877-35-0P**, 4,4'-Biphenol-4,4'-dichlorodiphenyl sulfone-disodium 3,3'-sulfonylbis(6-chlorobenzenesulfonate) copolymer
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of hydrophilic aromatic sulfonated polyether-polysulfones)

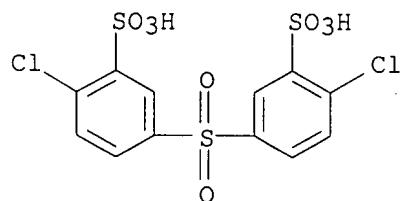
RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI)
 (CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

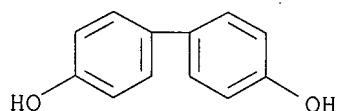


●2 Na

CM 2

CRN 92-88-6

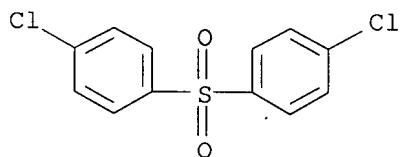
CMF C12 H10 O2



CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Applby, A	1999		72	Sci American	
Dumais, J	1986	19	1884	Macromolecules	HCAPLUS
Gunduz, N				this issue	
Jacoby, M	1999	77	31	C&E News	
Kovar, R				Unpublished results	
McGrath, J	1981		327	"Poly(Aryl Ether) Me	
McGrath, J	1999			"Sulfonated Poly(ary	
McGrath, J	1984	22	721	J of Polym Sci	
McGrath, J	1983	1	347	Physicochemical Aspe	
Mercier, R	1999			Fifth European Techn	
Noshay, A	1976	20	1885	J of Appl Polym Sci	HCAPLUS
Robeson, L	1983			US 4380598	HCAPLUS
Robeson, L	1978	4	405	Dynamic Mechanical C	HCAPLUS
Shobha, H				this issue	
Springer, T	1991	138	2334	Journal of the Elect	HCAPLUS
Tran, C	1980			M S thesis, "Quantit	
Udea, M	1993	31	85	J Polym Sci, Polym C	
Zhang, Y	1999	40	480	Polym Preprint	HCAPLUS

L95 ANSWER 19 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 1995:426587 HCAPLUS

DN 122:189696

TI Hydrogel gas-separation membranes with selective permeation of carbon dioxide

IN Kazama, Shingo; Kanzawa, Choji

PA Kogyo Gijutsuin, Japan; Chikyu Kankyo Sangyo Gijutsu K; Shinnippon Seitetsu KK

SO Jpn. Kokai Tokkyo Koho, 10 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 06210145	A2	19940802	JP 1992-283486	19920930 <--
	JP 3247953	B2	20020121		
	US 5409525	A	19950425	US 1993-128098	19930929 <--

PRAI JP 1992-283486 A 19920930 <--
AB The title membranes contain a water- or CO₂-compatible material aqueous solution

placed evenly on a support film made of solvent-so. polymers having bulky structural portion and hydrophilic functional group in the repeating unit. A polymer was prepared from 9,9-bis(4-hydroxyphenyl)fluorene, 4,4'-dichlorodiphenyl sulfone, and 4,4'-dichlorodiphenyl sulfone-3,3'-disulfonic acid, cast from a N-methyl-2-pyrrolidone solution on a glass plate, and gelled in water to give a hydrogel film with water absorption 9:1 and CO₂/N₂ permeation ratio 32.

IC ICM B01D0069-02
ICS B01D0071-82

ICA B01D0071-68

CC 38-3 (Plastics Fabrication and Uses)

IT **Membranes**

(hydrogel gas-separation membranes with selective permeation of carbon dioxide)

IT 161635-66-1P 161635-67-2P 161635-68-3P 161635-70-7P
161635-71-8P

RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (hydrogel gas-separation membranes with selective permeation of carbon dioxide)

IT 161635-66-1P

RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (hydrogel gas-separation membranes with selective permeation of carbon dioxide)

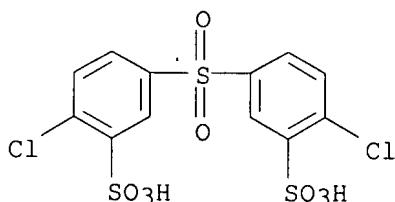
RN 161635-66-1 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, polymer with 4,4'-(9H-fluoren-9-ylidene)bis[phenol] and 1,1'-sulfonylbis[benzene] dichloro deriv. (9CI) (CA INDEX NAME)

CM 1

CRN 57570-28-2

CMF C12 H8 Cl2 O8 S3



CM 2

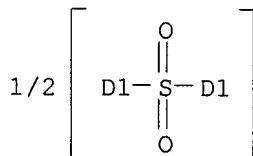
CRN 29315-80-8

CMF C12 H8 Cl2 O2 S

CCI IDS



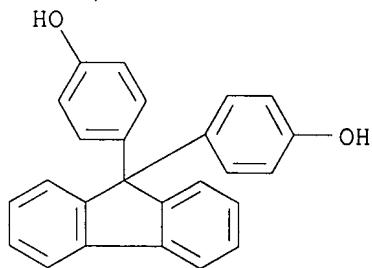
D1-Cl



CM 3

CRN 3236-71-3

CMF C25 H18 O2



L95 ANSWER 20 OF 21 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 1993:409381 HCAPLUS

DN 119:9381

TI heat-resistant sulfonated polysulfones

IN Harada, Yoshiyuki; Teramoto, Takeo

PA Nippon Steel Corp., Japan

SO Jpn. Kokai Tokkyo Koho, 4 pp.

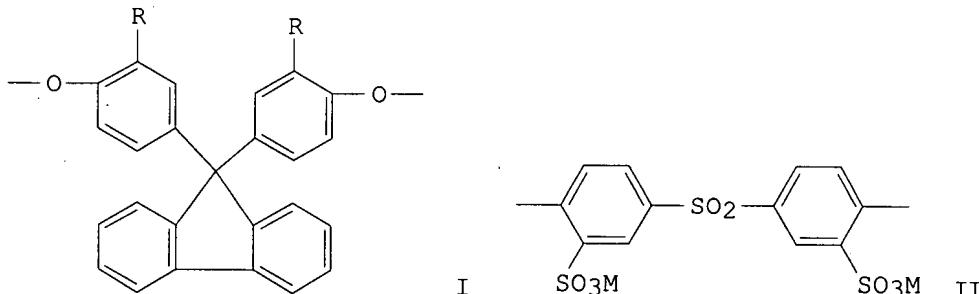
CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 05001149	A2	19930108	JP 1991-178920	19910625 <--
PRAI	JP 1991-178920		19910625 <--		
GI					



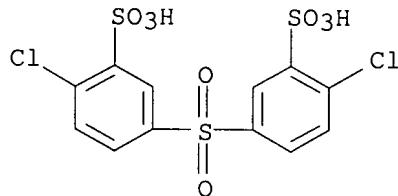
AB Title polysulfones with controllable sulfonation ratio and good yield, useful as materials of **ion-exchange resins** and separation **membranes**, have repeating units $(XY)_m(XZ)_n$ [X = I (R = H, Me, Et); Y = $-p-C_6H_4SO_2-p-C_6H_4-$; Z = II (M = H, alkali metal, tetraalkylammonium); m, n = repeating number; Y/Z mol ratio 99/1-1/100] and inherent viscosity 0.3-3.0. Thus, 9,9-bis(4-hydroxyphenyl)fluorene 20, 4,4'-dichlorodiphenyl sulfone 19, and di-Na 4,4'-dichlorodiphenyl sulfone-3,3'-disulfonate 1 mmol were mixed with K_2CO_3 , dimethylacetamide, toluene, dehydrated, and treated at 120° for 15 h and at 160° for 24 h to give a sulfonated polysulfone with Y/Z mol ratio 95/5, yield 100%, inherent viscosity 0.86 dL/g, **ion-exchange** volume 0.14 meq/g, and water contact angle 69.6° (air side) and 61.5° (glass surface side).

IC ICM C08G0075-20
 CC 35-5 (Chemistry of Synthetic High Polymers)
 Section cross-reference(s): 38
 ST heat resistance sulfonated polysulfone; **ion exchange resin** sulfonated polysulfone; sepn **membrane** sulfonated polysulfone
 IT **Ion exchangers**
 (sulfonated polysulfones for, heat-resistant)
 IT **Membranes**
 (sulfonated polysulfones, heat-resistant)
 IT Heat-resistant materials
 (sulfonated polysulfones, preparation of, for **ion-exchange resins** and separation **membranes**)
 IT Polysulfones, compounds
 RL: PREP (Preparation)
 (sulfonated, preparation of, heat-resistant, for **ion-exchange resins** and separation **membranes**)
 IT 146673-89-4P
 RL: PREP (Preparation)
 (preparation of, heat-resistant, for **ion-exchange resins** and separation **membranes**)
 IT 146673-89-4P
 RL: PREP (Preparation)
 (preparation of, heat-resistant, for **ion-exchange resins** and separation **membranes**)
 RN 146673-89-4 HCPLUS
 CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with 4,4'-(9H-fluoren-9-ylidene)bis[phenol] and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

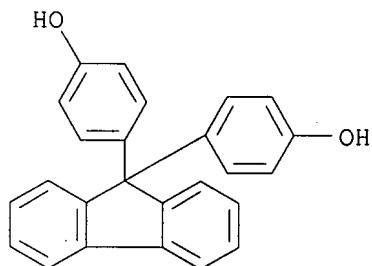


●2 Na

CM 2

CRN 3236-71-3

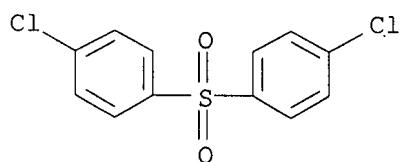
CMF C25 H18 O2



CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



L95 ANSWER 21 OF 21 HCPLUS COPYRIGHT 2006 ACS on STN

AN 1993:148174 HCPLUS

DN 118:148174

TI Synthesis and characterization of aromatic poly(ether sulfone)s containing pendent sodium sulfonate groups

AU Ueda, Mitsuru; Toyota, Hidetsugu; Ouchi, Takao; Sugiyama, Junichi; Yonetake, Koichiro; Masuko, Toru; Teramoto, Takero

CS Fac. Eng., Yamagata Univ., Yonezawa, 992, Japan

SO Journal of Polymer Science, Part A: Polymer Chemistry (1993), 31(4), 853-8

CODEN: JPACEC; ISSN: 0887-624X

DT Journal

LA English

AB Poly(ether sulfones) containing pendent sodium sulfonate groups were prepared by

the aromatic nucleophilic substitution reaction of 4,4'-dichlorodiphenylsulfone (I) and sodium 5,5'-sulfonylbis(2-chlorobenzenesulfonate) (II) with bisphenols in the presence of K₂CO₃ in N,N-dimethylacetamide. A new monomer containing the sodium sulfonate groups was synthesized by the sulfonation of I with fuming H₂SO₄. The polycondensation proceeded smoothly at 170° and produced the desired poly(ether sulfone)s containing the Na sulfonate with inherent viscosities up to 1.2 dL/g. The polymers were quite soluble in strong acid, dipolar aprotic solvents, m-cresol, and dichloromethane. The thermogravimetry of the polymers showed excellent thermal stability, indicating that 10% weight losses of the polymers were observed in the range above 460° in N atmospheric. Both the glass transition temps. and hydrophilicity of the polymers increased with increasing their concns. of Na sulfonate groups.

CC 35-5 (Chemistry of Synthetic High Polymers)

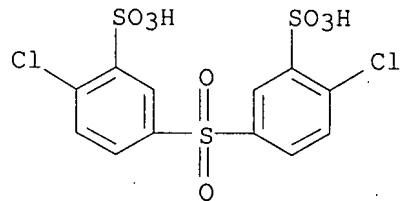
Section cross-reference(s): 36

IT 146673-85-0P 146673-88-3P **146673-89-4P** 146696-52-8P
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation and thermal and mech. and wetting properties of)
 IT **146673-89-4P**
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation and thermal and mech. and wetting properties of)
 RN 146673-89-4 HCAPLUS
 CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer
 with 4,4'-(9H-fluoren-9-ylidene)bis[phenol] and 1,1'-sulfonylbis[4-
 chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 51698-33-0

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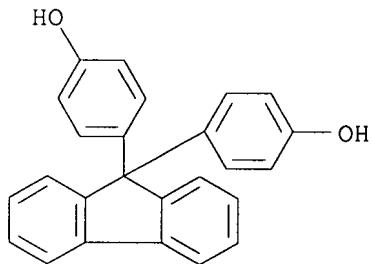


●2 Na

CM 2

CRN 3236-71-3

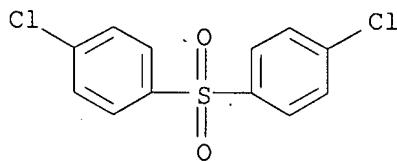
CMF C25 H18 O2



CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



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L116 ANSWER 1 OF 2 HCPLUS COPYRIGHT 2006 ACS on STN
 AN 2003:319959 HCPLUS
 DN 138:339060
 TI Crosslinkable aromatic resins having protonic acid groups, and ion conductive polymer membranes, binders, and fuel cells made by using the same
 IN Ishikawa, Junichi; Kuroki, Takashi; Fujiyama, Satoko; Omi, Takehiko; Nakata, Tomoyuki; Okawa, Yuichi; Miyazaki, Kazuhisa; Fujii, Shigeharu; Tamai, Shoji
 PA Mitsui Chemicals, Inc., Japan
 SO PCT Int. Appl., 132 pp.
 CODEN: PIXXD2
 DT Patent
 LA Japanese
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2003033566	A1	20030424	WO 2002-JP10536	20021010 <--
	W: CA, CN, IN, JP, KR, US RW: DE, FR, GB, IT, SE				
	TW 236486	B1	20050721	TW 2002-91123279	20021009 <--
	CA 2463429	AA	20030424	CA 2002-2463429	20021010 <--
	EP 1457511	A1	20040915	EP 2002-775319	20021010 <--
	R: DE, FR, GB, IT, SE, SI, LT, LV, RO, MK, AL				
	CN 1630676	A	20050622	CN 2002-820224	20021010 <--
	US 2004191602	A1	20040930	US 2004-820842	20040409 <--
PRAI	JP 2001-312799	A	20011010 <--		
	JP 2002-182252	A	20020621 <--		
	WO 2002-JP10536	W	20021010 <--		
AB	The invention relates to (A) a crosslinkable aromatic resin which has crosslinking groups and protonic acid groups and is suitable for electrolyte membranes and binders for fuel cells, (B) polymeric electrolyte membranes and binders for fuel cells, made by using the resin, and (C) fuel cells made by using the membranes or the binders. The aromatic resin has crosslinking groups which are not derived from protonic acid groups and are capable of causing crosslinking without the formation of a leaving component, and exhibits excellent ionic conductivity, heat resistance, water resistance, and adhesion, and low methanol permeability. It is preferable that the aromatic resin bears as the crosslinking groups both C1-10 alkyl bonded directly to an aromatic ring and carbonyl or carbon-carbon double or triple bonds, while preferred examples of the crosslinkable aromatic resin include aromatic polyether, aromatic polyamide, aromatic polyimide, aromatic polyamide-imide, and aromatic polyazole, each of which has crosslinking groups described above. Thus, 5,5'-carbonylbis(sodium 2-fluorobenzenesulfonate) obtained from 0.525 mol 4,4'-				

difluorobenzophenone and 210 mL 50% sulfuric acid 4.22, 4,4'-difluorobenzophenone 2.18, and 2,2-bis(3,5-dimethyl-4-hydroxyphenyl)propane 5.69 g were reacted at 160° for 4 h in the presence of potassium carbonate to give 10.39 g polyether ketone powder with reduced viscosity 0.85 dL/g, glass transition temperature 230°, and 5% weight loss temperature 367°, which was applied on a glass and dried at 200° for 4 h to give a membrane with conductivity 0.018 S/cm at 30° and 0.065 S/cm at 90°.

IC ICM C08G0065-40

ICS C08G0069-48; C08G0073-10; C08J0005-22; H01M0008-02

CC 37-3 (Plastics Manufacture and Processing)

Section cross-reference(s): 38, 52

IT **Membranes, nonbiological**

(ionic conductive; preparation of crosslinkable aromatic resins having protonic

acid groups for ion conductive polymer membranes, binders, and fuel cells)

IT 108-31-6DP, Maleic anhydride, reaction products with protonic acid group-containing polymers 405-99-2DP, 4-Fluorostyrene, reaction products with sulfonated polymers 620-18-8DP, 3-Vinylphenol, reaction products with sulfonated polymers 1076-99-9DP, 4-Allylbenzoic acid, reaction products with protonic acid group-containing polymers 1120-71-4DP, Propanesultone, reaction products with aromatic polyether-polyketones 1745-89-7DP, reaction products with sulfonated polymers 20161-52-8DP, reaction products with sulfonated polymers 102501-86-0DP, 2-Allylphenol-2,6-dimethylphenol copolymer, sodium sulfonated 146673-88-3DP, reaction products with ethylenically unsatd. compds. 163395-54-8DP, reaction products with protonic acid group-containing polymers 210531-46-7DP, reaction products with ethenylphenol 342047-78-3DP, reaction products with ethenylphenol 342047-79-4DP, reaction products with ethenylphenol 515144-35-1P 515144-36-2P 515144-37-3P 515144-38-4P 515144-39-5P 515144-40-8P 515144-41-9P 515144-42-0P 515144-44-2DP, sulfonated 515144-45-3DP, sulfonated 515144-47-5P 515144-48-6P 515144-51-1DP, reaction products with ethenylbenzoyl chloride 515144-53-3DP, reaction products with ethenylbenzoyl chloride 515144-58-8P 515144-59-9P 515144-66-8DP, reaction products with ethenylphenol 515144-67-9DP, reaction products with ethenylphenol 515144-68-0DP, reaction products with ethenylphenol 515144-69-1DP, reaction products with ethenylphenol 515144-70-4DP, reaction products with ethylenically unsatd. compds. 515144-71-5DP, reaction products with monoanhydride compds. 515144-72-6DP, reaction products with maleic anhydride 515144-73-7DP, reaction products with allylbenzoic acid, sulfonated 515144-74-8DP, reaction products with allylbenzoic acid, sulfonated 515144-75-9DP, reaction products with ethylenically unsatd. compds.

RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(crosslinked; preparation of crosslinkable aromatic resins having protonic acid

groups for ion conductive polymer membranes, binders, and fuel cells)

IT 24938-67-8DP, Poly(2,6-dimethyl-1,4-phenylene oxide), sodium sulfonated 267877-35-0DP, reaction products with ethenylphenol 515144-25-9P 515144-26-0P 515144-27-1P 515144-28-2P 515144-29-3P 515144-30-6P 515144-31-7P 515144-32-8P 515144-33-9P 515144-60-2P 515144-61-3P 515144-62-4P 515144-64-6DP, sulfonated 515144-65-7DP, sulfonated 515811-98-0P

RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(preparation of crosslinkable aromatic resins having protonic acid groups

for

ion conductive polymer membranes, binders, and fuel cells)
 IT 515144-68-0DP, reaction products with ethenylphenol
 RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or
 engineered material use); PREP (Preparation); USES (Uses)
 (crosslinked; preparation of crosslinkable aromatic resins having protonic
 acid

groups for ion conductive polymer membranes, binders, and fuel cells)

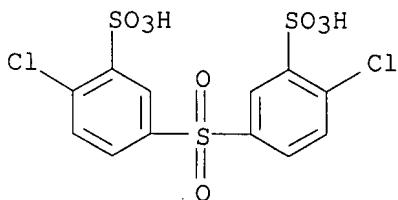
RN 515144-68-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer
 with methylenebis[phenol] and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA
 INDEX NAME)

CM 1

CRN 51698-33-0

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●2 Na

CM 2

CRN 1333-16-0

CMF C13 H12 O2

CCI IDS



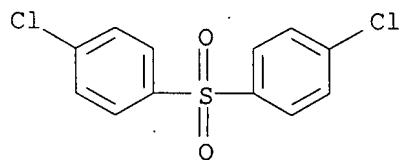
D1-OH

1/2 [D1-CH2-D1]

CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



IT 267877-35-0DP, reaction products with ethenylphenol
 RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or
 engineered material use); PREP (Preparation); USES (Uses)
 (preparation of crosslinkable aromatic resins having protonic acid groups
 for

ion conductive polymer membranes, binders, and fuel cells)

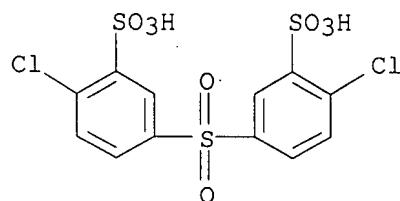
RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer
 with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (9CI)
 (CA INDEX NAME)

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CRN 51698-33-0

CMF C12 H8 Cl2 O8 S3 . 2 Na

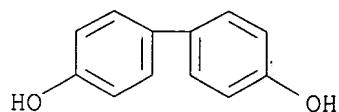


●2 Na

CM 2

CRN 92-88-6

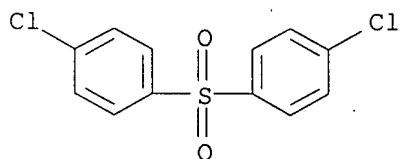
CMF C12 H10 O2



CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (R WK)	Referenced File
Commissariat A L'Energi	2001			WO 0125312 A	HCAPLUS
Commissariat A L'Energi	2001			JP 2000510511 A	
Commissariat A L'Energi	2001			US 200120082 A	
Commissariat A L'Energi	2001			FR 2799198 A	HCAPLUS
Hoechst Ag	1999			JP 11-502245 A	
Hoechst Ag	1999			WO 9629359 A	HCAPLUS
Kaneka Corp	2002			JP 2002105199 A	HCAPLUS
Kaneka Corp	2002			JP 2002121281 A	HCAPLUS
Sumitomo Electric Indus	2002			JP 2002358978 A	HCAPLUS
Sumitomo Electric Indus	2002			JP 2002367627 A	HCAPLUS
Victrex Manufacturing L	2000			WO 0015691 A	HCAPLUS
Victrex Manufacturing L	2000			JP 2002524631 A	HCAPLUS

L116 ANSWER 2 OF 2 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 1995:426587 HCAPLUS

DN 122:189696

TI Hydrogel gas-separation membranes with selective permeation of
carbon dioxide

IN Kazama, Shingo; Kanzawa, Choji

PA Kogyo Gijutsuin, Japan; Chikyu Kankyo Sangyo Gijutsu K; Shinnippon
Seitetsu KK

SO Jpn. Kokai Tokkyo Koho, 10 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 06210145	A2	19940802	JP 1992-283486	19920930 <--
	JP 3247953	B2	20020121		
	US 5409525	A	19950425	US 1993-128098	19930929 <--
PRAI	JP 1992-283486	A	19920930 <--		

AB The title membranes contain a water- or CO₂-compatible material aqueous
solution

placed evenly on a support film made of solvent-so. polymers having bulky structural portion and hydrophilic functional group in the repeating unit. A polymer was prepared from 9,9-bis(4-hydroxyphenyl)fluorene, 4,4'-dichlorodiphenyl sulfone, and 4,4'-dichlorodiphenyl sulfone-3,3'-disulfonic acid, cast from a N-methyl-2-pyrrolidone solution on a glass plate, and gelled in water to give a hydrogel film with water absorption 9:1 and CO₂/N₂ permeation ratio 32.

IC ICM B01D0069-02

ICS B01D0071-82

ICA B01D0071-68

CC 38-3 (Plastics Fabrication and Uses)

ST polyether polysulfone selective permeable membrane; **carbon dioxide** selective permeability membrane

IT **Membranes**

(hydrogel gas-separation membranes with selective permeation of **carbon dioxide**)

IT Polyimides, uses

RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (hydrogel gas-separation membranes with selective permeation of **carbon dioxide**)

IT Polysulfones, uses

RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (polyether-, hydrogel gas-separation membranes with selective permeation of **carbon dioxide**)

IT Polyethers, uses

RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (polysulfone-, hydrogel gas-separation membranes with selective permeation of **carbon dioxide**)

IT 161635-66-1P 161635-67-2P 161635-68-3P 161635-70-7P

161635-71-8P

RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (hydrogel gas-separation membranes with selective permeation of **carbon dioxide**)

IT 124-38-9P, **Carbon dioxide**, preparation

RL: PUR (Purification or recovery); PREP (Preparation) (hydrogel gas-separation membranes with selective permeation of **carbon dioxide**)

IT 161635-66-1P

RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (hydrogel gas-separation membranes with selective permeation of **carbon dioxide**)

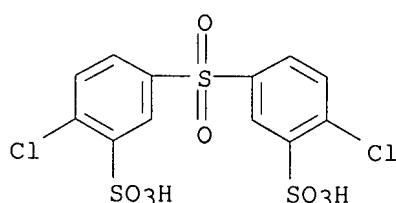
RN 161635-66-1 HCPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, polymer with 4,4'-(9H-fluoren-9-ylidene)bis[phenol] and 1,1'-sulfonylbis[benzene] dichloro deriv. (9CI) (CA INDEX NAME)

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CRN 57570-28-2

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CM 2

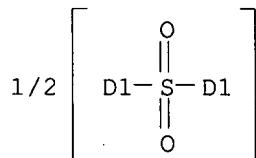
CRN 29315-80-8

CMF C12 H8 Cl2 O2 S

CCI IDS

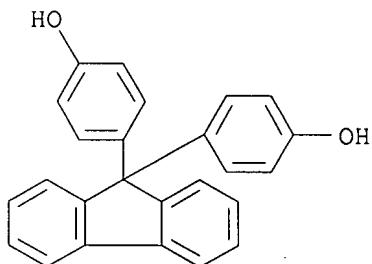


D1-Cl



CM 3

CRN 3236-71-3
 CMF C25 H18 O2



IT 124-38-9P, **Carbon dioxide**, preparation
 RL: PUR (Purification or recovery); PREP (Preparation)
 (hydrogel gas-separation membranes with selective permeation of
carbon dioxide)
 RN 124-38-9 HCAPLUS
 CN Carbon dioxide (8CI, 9CI) (CA INDEX NAME)

O=C=O

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 L6 45 S L5
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 L8 2 S L7
 L9 SCR 2043
 L10 21 S L7 AND L9
 L11 618 S L7 AND L9 FUL
 SAV TEMP L11 BERN530/A
 L12 42 S L11 AND 1/NC
 L13 3 S L12 AND (C24H16010S3 OR C25H1609S2 OR C38H2409S2)
 L14 11 S L12 AND (C27H22010S3 OR C24H16012S4 OR C31H30010S3 OR C25H160
 L15 10 S L14 NOT 196301-55-0
 L16 93 S L11 AND C12H1002
 L17 82 S L11 AND 92-88-6/CRN
 L18 11 S L16 NOT L17
 L19 10 S L18 NOT 1079-21-6/CRN
 L20 92 S L17, L19
 L21 57 S L11 AND C25H1802
 L22 57 S L11 AND 3236-71-3/CRN
 L23 57 S L21, L22
 L24 135 S L20, L23
 L25 31 S L11 AND 843-55-0/CRN
 L26 31 S L11 AND C18H2002
 L27 31 S L25, L26
 L28 160 S L24, L27
 L29 3 S L2 AND L28
 L30 2 S L2 NOT L29
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 SAV TEMP L33 BERN530A/A
 L34 27 S L33 AND L28
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 L37 153 S L28, L36 NOT L35
 L38 84 S L37 AND (C6H6O2 OR C13H8F207S2 OR C19H12F2013S4)
 L39 15 S L38 NOT 345-92-6/CRN
 SEL RN 7 8 10 11 13 14
 L40 6 S E6-E11
 L41 69 S L38 NOT L39
 L42 5 S L41 AND 3/NC
 L43 29 S L41 AND 4/NC
 L44 5 S L43 AND NA/ELS
 L45 35 S L41 NOT L42-L44
 SEL RN 5 14 15 24 27 30 33
 L46 7 S E12-E18
 L47 4 S L40 NOT (862773-05-5 OR 1478-61-1/CRN)
 L48 2 S L15 AND (912548-40-4 OR 912548-38-0)
 L49 69 S L37 NOT L38-L48
 L50 13 S L49 AND C7H3CL2N
 SEL RN 3 4 6 7
 L51 9 S L50 NOT E19-E22
 L52 56 S L49 NOT L50
 L53 12 S L52 AND 3/NC
 SEL RN 2 7 10 12
 L54 4 S E23-E26

L55 22 S L52 AND 4/NC
 SEL RN 6 8 12 13 15-19 21 22
L56 11 S E27-E37
L57 22 S L52 NOT L53, L55
L58 50 S L13, L29, L42, L44, L46, L47, L48, L51, L54, L56
 SAV TEMP L58 BERN530B/A
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L82 10 S L74, L75 NOT L81
 SEL AN DN 5 7-10
L83 5 S L82 NOT E38-E52
L84 16 S L81, L83
L85 5 S L74, L75 NOT L84
 E ION EXCHANGE/CT
 E E3+ALL
L86 26135 S E3+NT
L87 8009 S E11+OLD, NT OR E12+OLD, NT
 E E13+ALL
L88 45068 S E4, E5, E13, E16, E17, E18, E21-E23, E25
L89 4 S L68, L69 AND L86-L88
 E MEMBRANE/CT
 E E3+ALL
L90 43734 S E1
 E E2+ALL
L91 118206 S E3+OLD OR E15-E21
L92 11 S L68, L69 AND L90, L91
L93 17 S L84, L89, L92
L94 4 S L69, L69 NOT L93
L95 21 S L93, L94 AND L1, L63-L94

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L96 56 S L71, L72, L95

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L105 34 S L104 NOT 345-92-6/CRN
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L107 136 S L98 NOT L99-L106
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L111 1 S L98 AND L110

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L116 2 S L115 AND L95
L117 2 S L112-L115 NOT L116

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=> fil hcaplus

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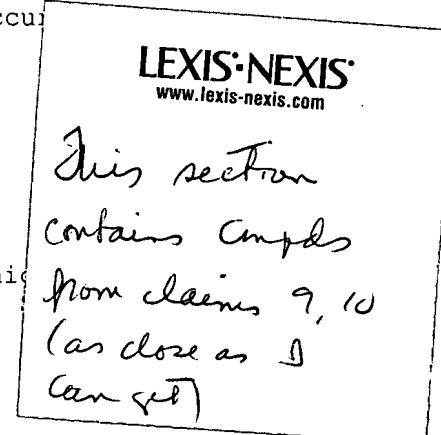
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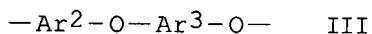
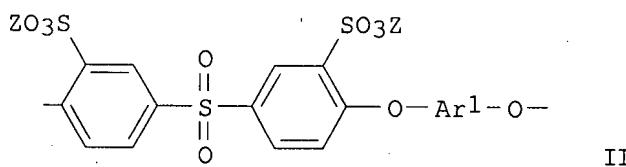
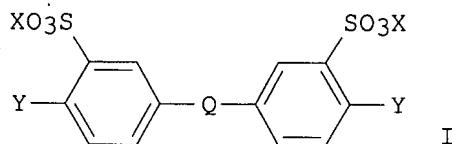
L15 ANSWER 1 OF 4 HCAPLUS COPYRIGHT 2006 ACS on STN
 AN 2004:355275 HCAPLUS
 DN **140:376230**
 TI Composite ion exchanger membrane
 IN Kitamura, Kota; Sakaguchi, Yoshimitsu; Nagahara, Shiro; Takimoto, Naohiko; Sugihara, Hideki; Takase, Tooru; Saito, Miyako
 PA Toyo Boseki Kabushiki Kaisha, Japan
 SO PCT Int. Appl., 92 pp.
 CODEN: PIXXD2
 DT Patent
 LA Japanese
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2004036679	A1	20040429	WO 2003-JP13278	20031016
	W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
	JP 2004139836	A2	20040513	JP 2002-303289	20021017
	JP 2004139837	A2	20040513	JP 2002-303290	20021017
	JP 2004143388	A2	20040520	JP 2002-312837	20021028
	JP 2004169003	A2	20040617	JP 2003-355364	20031015
	AU 2003273034	A1	20040504	AU 2003-273034	20031016
	US 2006241192	A1	20061026	US 2005-530965	20050411
PRAI	JP 2002-303289	A	20021017		



JP 2002-303290	A	20021017
JP 2002-312837	A	20021028
JP 2002-313025	A	20021028
WO 2003-JP13278	W	20031016

GI



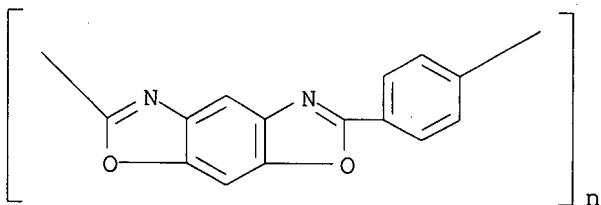
AB The membrane has ion exchanger resin in the continuous through holes in a support membrane, where the ion exchanger resin contains an aromatic ether and/or its derivative, formed by polymerization of mixture containing monomers I (Q =-SO₂- or -CO-, X = H, Li, Na, or K, Y = F, Cl, Br, or I), aromatic dihalides, and bisphenol compound and alkali metal (bi)carbonate. The ion exchange resin contain 0-1000 structural units II (Z = H, Li, Na, K, or cation derived from aliphatic or aromatic amines; Ar₁ and Ar₃ = bivalent organic groups, Ar₂ = bivalent organic groups containing ≥1 arom ring having electron attracting group) and 0-1000 structural units III. The composite membrane may be used as fuel cell electrolyte.

IT 60871-72-9

RL: TEM (Technical or engineered material use); USES (Uses)
(composite membranes containing ion exchanger resins in porous polymer support membranes for fuel cell electrolytes)

RN 60871-72-9 HCPLUS

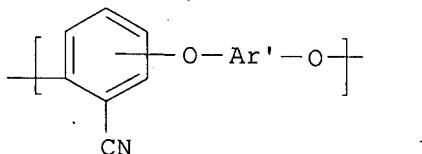
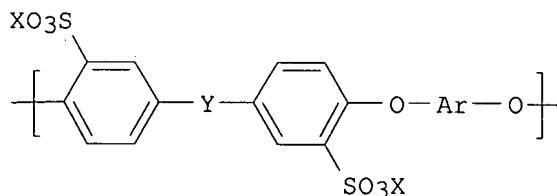
CN Poly(benzo[1,2-d:5,4-d']bisoxazole-2,6-diyl-1,4-phenylene) (9CI) (CA INDEX NAME)



L15 ANSWER 2 OF 4 HCPLUS COPYRIGHT 2006 ACS on STN
 AN 2004:333769 HCPLUS
 DN 140:340474
 TI Polyarylene ether compounds containing sulfonic acid groups, their compositions and manufacture method
 IN Sakaguchi, Yoshimitsu; Kitamura, Kota; Nagahara, Shigenori; Yamashita, Masahiro; Nakao, Junko
 PA Toyo Boseki Kabushiki Kaisha, Japan
 SO PCT Int. Appl., 75 pp.
 CODEN: PIXXD2
 DT Patent
 LA Japanese
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2004033534	A1	20040422	WO 2003-JP12850	20031007
	W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
	JP 2004244437	A2	20040902	JP 2003-32622	20030210
	AU 2003268784	A1	20040504	AU 2003-268784	20031007
	JP 2004149779	A2	20040527	JP 2003-348477	20031007
	EP 1561768	A1	20050810	EP 2003-748749	20031007
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
	CN 1703443	A	20051130	CN 2003-80100996	20031007
	JP 2004263167	A2	20040924	JP 2003-367183	20031028
	US 2006166048	A1	20060727	US 2005-530199	20050404
PRAI	JP 2002-295284	A	20021008		
	JP 2003-32621	A	20030210		
	JP 2003-32622	A	20030210		
	WO 2003-JP12850	W	20031007		

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AB The title polymers, showing good ion conductivity and heat resistance, comprise the units of I and II (Ar, Ar' = divalent aromatic group; X = H, monovalent cation; Y = SO₂, CO). The polymers and their compns. containing polybenzimidazoles are useful for ion-conductive films, electrolytes, fuel cells, and adhesives. Thus, a 1:0.38:0.62 (mol) 4,4'-biphenol-3,3'-disulfo-4,4'-dichlorodiphenylsulfone disodium salt-2,6-dichlorobenzonitrile copolymer was prepared and made into a film showing 3%-weight loss temperature 380° and ion conductivity 0.14 S/cm.

IT **426255-33-6P**

RL: IMF (Industrial manufacture); POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(heat-resistant sulfo-containing polyethers for ion-conductive films)

RN 426255-33-6 HCAPLUS

CN Poly[1H-benzimidazole-2,5-diylsulfonyl-1H-benzimidazole-5,2-diyl(sulfo-1,4-phenylene) monosodium salt] (9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Foster-Miller Inc	1999			JP 2003503510 A	
Foster-Miller Inc	1999			WO 99010165 A	
Honda Motor Co Ltd	2002			JP 2002367629 A	HCAPLUS
Jsr Corp	2002			JP 2002220530 A	HCAPLUS
Toyobo Co Ltd	2003			JP 2003012795 A	HCAPLUS
Toyobo Co Ltd	2003			JP 2003217342 A	HCAPLUS

L15 ANSWER 3 OF 4 HCAPLUS COPYRIGHT 2006 ACS on STN

AN 2003:907123 HCAPLUS

DN **139:382455**

TI Compositions containing acidic group-containing polybenzimidazoles and acidic group-containing polymers for adhesives and ion conductor membranes used in electrode composites of fuel cells

IN Sakaguchi, Yoshimitsu; Kitamura, Kota; Nagahara, Shigenori

PA Toyobo Co., Ltd., Japan

SO Jpn. Kokai Tokkyo Koho, 14 pp.

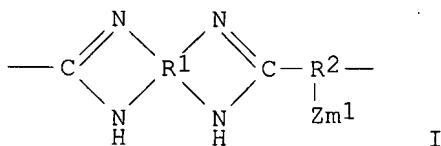
CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI JP 2003327825	A2	20031119	JP 2002-133112	20020508
PRAI JP 2002-133112		20020508		
GI				



AB The compns. giving polymer electrolyte membranes with high ion conductivity while

suppressing swelling in high-temperature humid state, comprise polybenzimidazoles having structural components I ($m_1 = 1-4$; $R_1 =$ imidazole ring-forming tetravalent aromatic linkage; $R_2 =$ divalent aromatic linkage; R_1 and R_2 may be single aromatic ring or linked residue or condensed ring of plural aromatic rings optionally with stable substituent; $Z =$ sulfonic acid and/or phosphonic acid residue optionally with partial salt structure) and acidic group-containing polymers. Thus, a solution of polybenzimidazole prepared from 3,3',4,4'-tetraaminodiphenylsulfone and 2,5-dicarboxybenzenesulfonic acid monosodium salt was mixed with a solution of sulfonated 9,9-bis(4-hydroxyphenyl)fluorene-bis(4-hydroxyphenyl)sulfone-4,4'-difluorodiphenylsulfone copolymer to give a mixture, which was processed to give a film showing ion conductivity (80°, 95%RH) 0.07 S/cm.

IT 426255-33-6P

RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(compns. containing acidic group-containing polybenzimidazoles and acidic group-containing polymers for fuel cell ion conductor membranes and adhesives)

RN 426255-33-6 HCPLUS

CN Poly[1H-benzimidazole-2,5-diylsulfonyl-1H-benzimidazole-5,2-diyl(sulfo-1,4-phenylene) monosodium salt] (9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

L15 ANSWER 4 OF 4 HCPLUS COPYRIGHT 2006 ACS on STN

AN 2003:319959 HCPLUS.

DN 138:339060

TI **Crosslinkable** aromatic resins having protonic acid groups, and ion conductive polymer membranes, binders, and fuel cells made by using the same

IN Ishikawa, Junichi; Kuroki, Takashi; Fujiyama, Satoko; Omi, Takehiko; Nakata, Tomoyuki; Okawa, Yuichi; Miyazaki, Kazuhisa; Fujii, Shigeharu; Tamai, Shoji

PA Mitsui Chemicals, Inc., Japan

SO PCT Int. Appl., 132 pp.
CODEN: PIXXD2

DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2003033566	A1	20030424	WO 2002-JP10536	20021010
	W: CA, CN, IN, JP, KR, US				
	RW: DE, FR, GB, IT, SE				
	TW 236486	B1	20050721	TW 2002-91123279	20021009
	CA 2463429	AA	20030424	CA 2002-2463429	20021010
	EP 1457511	A1	20040915	EP 2002-775319	20021010
	R: DE, FR, GB, IT, SE, SI, LT, LV, RO, MK, AL				
	CN 1630676	A	20050622	CN 2002-820224	20021010
	US 2004191602	A1	20040930	US 2004-820842	20040409
PRAI	JP 2001-312799	A	20011010		
	JP 2002-182252	A	20020621		
	WO 2002-JP10536	W	20021010		
AB	The invention relates to (A) a crosslinkable aromatic resin which has crosslinking groups and protonic acid groups and is suitable for electrolyte membranes and binders for fuel cells, (B) polymeric electrolyte membranes and binders for fuel cells, made by using the resin, and (C) fuel cells made by using the membranes or the binders. The aromatic resin has crosslinking groups which are not derived from protonic acid groups and are capable of causing crosslinking				

without the formation of a leaving component, and exhibits excellent ionic conductivity, heat resistance, water resistance, and adhesion, and low methanol permeability. It is preferable that the aromatic resin bears as the **crosslinking** groups both C1-10 alkyl bonded directly to an aromatic ring and carbonyl or carbon-carbon double or triple bonds, while preferred examples of the **crosslinkable** aromatic resin include aromatic polyether, aromatic polyamide, aromatic polyimide, aromatic polyamide-imide,

and

aromatic polyazole, each of which has **crosslinking** groups described above. Thus, 5,5'-carbonylbis(sodium 2-fluorobenzenesulfonate) obtained from 0.525 mol 4,4'-difluorobenzophenone and 210 mL 50% sulfuric acid 4.22, 4,4'-difluorobenzophenone 2.18, and 2,2-bis(3,5-dimethyl-4-hydroxyphenyl)propane 5.69 g were reacted at 160° for 4 h in the presence of potassium carbonate to give 10.39 g polyether ketone powder with reduced viscosity 0.85 dL/g, glass transition temperature 230°, and 5% weight loss temperature 367°, which was applied on a glass and dried at 200° for 4 h to give a membrane with conductivity 0.018 S/cm at 30° and 0.065 S/cm at 90°.

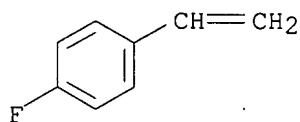
IT 405-99-2DP, 4-Fluorostyrene, reaction products with sulfonated polymers 515144-74-8DP, reaction products with allylbenzoic acid, sulfonated

RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(**crosslinked**; preparation of **crosslinkable** aromatic resins having protonic acid groups for ion conductive polymer membranes, binders, and fuel cells)

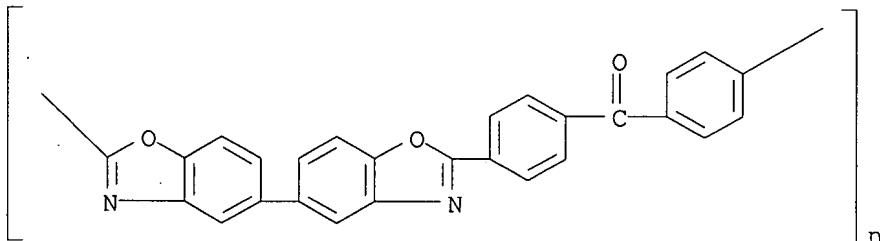
RN 405-99-2 HCPLUS

CN Benzene, 1-ethenyl-4-fluoro- (9CI) (CA INDEX NAME)



RN 515144-74-8 HCPLUS

CN Poly([5,5'-bibenzoxazole]-2,2'-diyl-1,4-phenylene carbonyl-1,4-phenylene) (9CI) (CA INDEX NAME)



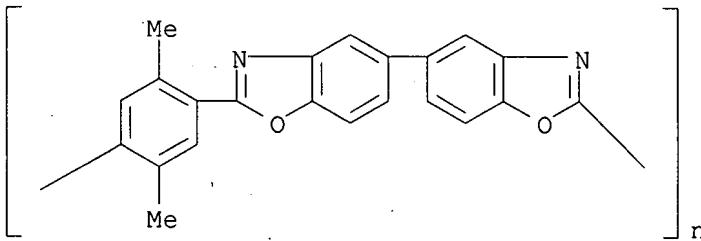
IT 515144-65-7DP, sulfonated

RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(preparation of **crosslinkable** aromatic resins having protonic acid groups for ion conductive polymer membranes, binders, and fuel cells)

RN 515144-65-7 HCPLUS

CN Poly([5,5'-bibenzoxazole]-2,2'-diyl(2,5-dimethyl-1,4-phenylene)] (9CI) (CA INDEX NAME)



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Commissariat A L'Energi	2001			WO 0125312 A	HCAPLUS
Commissariat A L'Energi	2001			JP 2000510511 A	
Commissariat A L'Energi	2001			US 200120082 A	
Commissariat A L'Energi	2001			FR 2799198 A	HCAPLUS
Hoechst Ag	1999			JP 11-502245 A	
Hoechst Ag	1999			WO 9629359 A	HCAPLUS
Kaneka Corp	2002			JP 2002105199 A	HCAPLUS
Kaneka Corp	2002			JP 2002121281 A	HCAPLUS
Sumitomo Electric Indus	2002			JP 2002358978 A	HCAPLUS
Sumitomo Electric Indus	2002			JP 2002367627 A	HCAPLUS
Victrex Manufacturing L	2000			WO 0015691 A	HCAPLUS
Victrex Manufacturing L	2000			JP 2002524631 A	

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ACT BERN530/A

L7 STR
L8 SCR 2043
L9 618 SEA FILE=REGISTRY SSS FUL L7 AND L8

L10 95 S L6 NOT L9
L11 3 S L10 AND (C8H7F OR C27H14N2O3 OR C22H14N2O2)
L12 5 S L3,L11

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L14 1 S L13 AND (?CROSSLINK? OR ?CROSS LINK?)
L15 4 S L13,L14

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